COESAM/PDFP-90/0001





US Army Corps of Engineers Mobile District

SECTION 14

DETAILED PROJECT REPORT

EMERGENCY SHORELINE PROTECTION

PORTERSVILLE BAY
MOBILE COUNTY, ALABAMA



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MAY 1990

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SECTION 14 DETAILED PROJECT REPORT

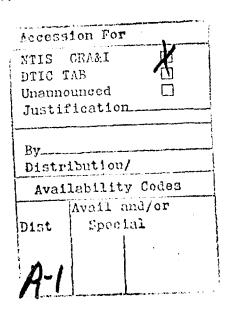
ON

EMERGENCY SHORELINE PROTECTION

AT

PORTERSVILLE BAY MOBILE COUNTY, ALABAMA

MAY 1990





SYLLABUS

Mobile County, Alabama, requested the assistance of the Mobile District of the United States Army Corps of Engineers in solving a shoreline and streambank erosion problem at Portersville Bay, Alabama. This Section 14 Detailed Project Report presents the findings of a study made to determine the economic justification and environmental feasibility of providing protection from those erosion problems. The study was conducted under the general authority of Section 14 of the Flood Control Act of 1946, as amended.

During the study, three alternatives; gabions, riprap, and timber bulkhead, were equally evaluated for structural protection of the shoreline. All three alternatives were determined to be effective in reducing the shoreline erosion. The timber bulkhead, however, was found to yield the greatest net economic benefits for the resources expended and is the most cost effective of the alternatives. Additionally, the timber bulkhead (NED Plan) is the most preferred option of the local sponsor.

The NED Plan consists of constructing a new timber bulkhead three feet in front of the existing bulkhead, with the existing bulkhead remaining in place except for the top 6-inches which would be cut below grade. The new bulkhead will consist of 2" x 8" vertical sheeting, 3" x 8" wales, and 10" diameter treated piles. The sheeting will be backed by non-woven filter fabric and backfilled with a pervious material (sandy soil).

The total first cost of this plan is \$686,800, of which \$500,000 would be Federal costs and \$186,800 would be non-Federal costs. The annual costs of the project is \$75,900, and the annual benefits are \$116,400; yielding a benefit-to-cost ratio of 1.5 to 1.

SECTION 14

DETAILED PROJECT REPORT PORTERSVILLE BAY, ALABAMA

TABLE OF CONTENTS

Wint.	<u>P</u> A	GE NO.
INTRODUCTION		1
AUTHORITY PURPOSE AND SCOPE PRIOR STUDIES EXISTING FEDERAL PROJECT		1 1 2 2
STUDY AREA		2
GEOGRAPHIC LOCATION CONTIGUOUS WATERWAYS PHYSIOGRAPHY CLIMATE TIDES STORMS WINDS WAVE ANALYSIS SUBSURFACE INVESTIGATIONS PROBLEMS AND OPPORTUNITIES STUDY CONSTRAINTS		2 4 4 5 6 7 8 9
PLANNING OBJECTIVES		13
NATIONAL OBJECTIVE STUDY OBJECTIVE		13 13
ALTERNATIVE PLANS		14
ALTERNATIVE 2 ALTERNATIVE 3 ALTERNATIVE 4 COMPARISON OF ALTERNATIVES		15 15 15 15
ECONOMIC ANALYSIS		24
EXISTING CONDITIONS NO ACTION ALTERNATIVE NO FEDERAL ACTION		24 24 25

TABLE OF CONTENT (cont'd)

ITEM	PAGE NO.
ALTERNATIVE A ALTERNATIVE B WITHOUT-PROJECT CONDITION WITH-PROJECT CONDITION	25 27 29 29
ENVIRONMENTAL CONSIDERATIONS	29
WATER QUALITY CERTIFICATION AND COASTAL ZONE CONSISTENCY CULTURAL RESCURCES	30 30
PROJECT DESIGN	30
DESIGN LOADS	31
PLAN IMPLEMENTATION	31
INSTITUTIONAL REQUIREMENTS	32
CONCLUSIONS	35
RECOMMENDATION	36
ENVIRONMENTAL DOCUMENTATION:	
ENVIRONMENTAL ASSESSMENT SECTION 404 (b)(1) EVALUATION REPORT FINDING OF NO SIGNIFICANT IMPACT (FONSI) STATEMENT OF FINDINGS	EA-1 ED-1 ED-10 ED-12

APPENDIX A--GEOTECHNICAL REPORT

APPENDIX B--COMPUTATION of ECONOMIC BENEFITS

APPENDIX C--LETTERS OF ASSURANCE FROM LOCAL SPONSOR

APPENDIX C--CODE OF ACCOUNTS COST ESTIMATE

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE NO.
1	STUDY AREA	3
2	SHORELINE PROTECTION PROJECT LIMITS	10
3	PICTORIAL VIEW OF CONDITION AT CONSIDERED PROJECT SITE	0 11
4	PICTORIAL VIEW OF CONDITION AT CONSIDERE PROJECT SITE	D 12
5	TYPICAL SECTIONS OF THE RIPRAP AND GABIO REVETMENT PLAN DESIGN	N 17
6	TYPICAL SECTION OF THE TIMBER BULKHEAD PLAN DESIGN	20

LIST OF TABLES

TABLE NO.	TITLE	PAGE NO.
. 1	TIDE LEVELS	5
2	STORM SURGE ELEVATIONS	6
3	MOBILE, ALABAMA WIND DATA	7
4	WAVE CHARACTERISTICS	8
5	ALTERNATIVE 2 - RIPRAP	16
6 ;	ALTERNATIVE 3 - GABIONS	18
7	ALTERNATIVE 4 - TIMBER BULKHEAD	19
8	COMPARISON OF ALTERNATIVES	21
9	FIRST COST - TIMBER BULKHEAD	22
10	FEDERAL AND NON-FEDERAL COST APPORTIONME TIMBER BULKHEAD - NED PLAN	NT 32
11	EVENTS PRIOR TO CONSTRUCTION	33

LIST OF PLATES

PLATE NUMBER

TITLE

1 - 12

PLAN - DETAILED DESIGN TIMBER BULKHEAD

v

INTRODUCTION

- 1. This report is in response to a request for Federal assistance in providing shoreline protection for prevention of damages to a county road in southern Mobile County by Mrs. Oliveth M. Archer, Mobile County Commissioner, to U.S. Representative Sonny Callahan of Alabama's First Congressional District. Mrs. Archer's letter is dated 30 September 1986, and Congressman Callahan's letter to Mobile District is dated 6 October 1986.
- 2. <u>AUTHORITY</u>. This report presents results of a study conducted under the continuing authority of Section 14 of the Flood Control Act of 1946, as amended by the Water Resources Development Act approved 17 November 1986. The amended section states:

"The Secretary of Army is hereby authorized to allot from any appropriations heretofore or hereafter made for flood control, not to exceed \$12,500,000 per year, for the construction, repair, restoration, and modification of emergency streambank and shoreline protection works to prevent damage to highways, bridge approaches, and public works, churches, hospitals, schools, and other nonprofit public services when in the opinion of the Chief of Engineers such work is advisable. Provided, that no more than \$500,000 shall be allocated for this purpose at any single locality from the appropriations for any one fiscal year."

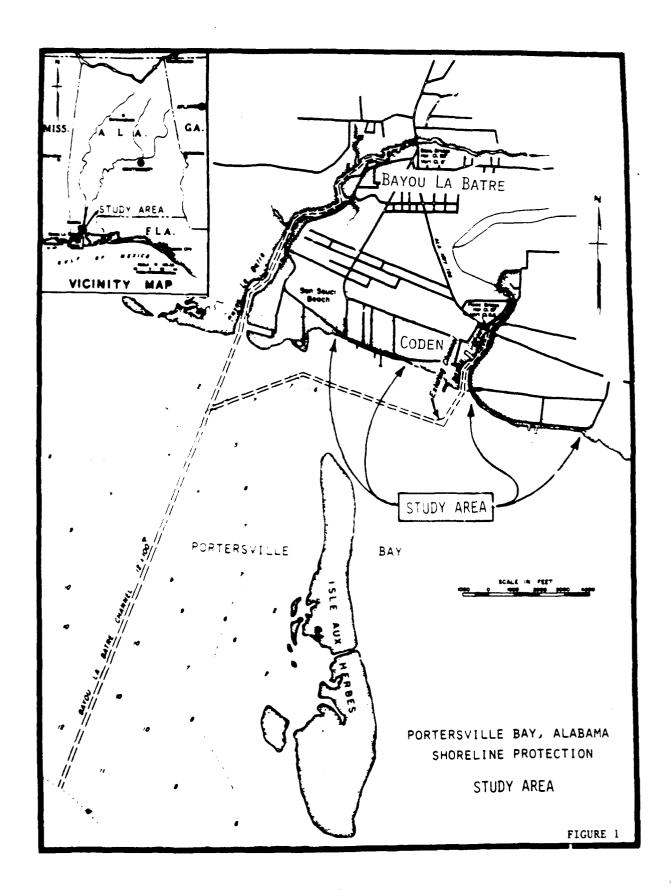
- 3. The report has been prepared in accordance with policies and procedures set forth in current Corps of Engineers regulations governing the development of small projects under the continuing authority.
- 4. PURPOSE AND SCOPE. The studies presented in this report pertain to streambank and shoreline protective measures at Portersville Bay in Bayou Coden, Alabama. This report describes the nature and extent of the erosion problems, presents alternative plans, and concludes that Federal participation is warranted. Field investigation were made of the study area by the Mobile District's planning, engineering, environmental, and cultural resources personnel. These investigations provided data for development of alternatives and assessment of impacts. Soils

investigations and topographic surveys of existing conditions were obtained in August 1988.

- 5. <u>PRIOR STUDIES</u>. There have been no previous shore protection studies in the project area.
- 6. EXISTING FEDERAL PROJECT. The existing Federal project at Bayou Coden, Alabama provides for a channel 8 feet deep by 60 feet wide extending from La Belle Avenue bridge south for about 3,000 feet through the bayou to Portersville Bay, thence 8 feet deep by 100 feet wide extending about 2.3 miles westward across Portersville Bay to connect with the Bayou La Batre channel, and a turning basin 8 feet deep by 60 feet wide by 100 feet long on the west side of the bayou channel about 500 feet south of the La Belle Avenue bridge. The existing project was authorized by the Chief of Engineers, June 2, 1969 under authority of Section 107 of the River and Harbor Act of 1960 and the River and Harbor Act of March 2, 1945 (H. Doc. 824 77th Cong, 2nd sess.). The project construction authorized in 1969 was initiated in April 1975, and completed in March 1976.

STUDY AREA

- 7. GEOGRAPHIC LOCATION. Portersville Bay is located in the town of Bayou Coden, in south Mobile County, Alabama. Portersville Bay, an arm of Mississippi Sound, is about 7.6 miles northwest of Cedar Point, the southern tip of the western mainland shore of Mobile Bay. Figure 1 is a general map which shows the study area.
- 8. The tributary area embraces southern Mobile County and the coastal waters and communities along Alabama's southwest coast. Principal cities and towns in the area are Mobile and suburbs, Bayou La Batre, Heron Bay, and Dauphin Island. Bayou Coden is served by Alabama Highway 188 which connects with U. S. Highway 90 and Interstate Highway No. 10 about 11 miles to the northwest between Mobile and Pascagoula, Mississippi, and with Alabama highway 163 about 7 miles to the southeast between Mobile and Dauphin Island. The nearest rail terminal is at St. Elmo, Alabama, 11 miles north of Bayou Coden, on the main line of the CSX (formerly Louisville & Nashville) Railroad. Commercial airline service is available at Mobile.



- 9. <u>CONTIGUOUS WATERWAYS</u>. The Gulf Intracoastal Waterway, with minimum dimensions of 12 by 125 feet, extends from Carrabelle, Florida through Mississippi Sound, to Brownsville Texas. Bayou La Batre, about two miles northwest of Bayou Coden, has a 12 by 100-foot channel extending from Mississippi Sound to a turning basin located about 3,000 feet below Highway 188 bridge. From the turning basin, a 12 by 75-foot channel extends upstream to Highway bridge 188. Dauphin Island, about 10 miles southwest of Bayou Coden, has navigation facilities for fishing and recreational craft, and Mobile Harbor and Pascagoula Harbor are important deep draft ports.
- 10. PHYSIOGRAPHY. The study area is classified as coastal lowlands, ranging from sea level to about 30 feet in elevation and from 1 to 10 miles in width. These flat to gently undulating, locally swampy lowlands are underlain by alluvial, deltaic, estuarine, and coastal deposits which merge with the pluvial-deltaic plains of the streams in the area. Many tidally influenced creeks, rivers and estuaries indent the coastline.
- Bayou Coden and Mississippi Sound are underlain by consolilated and unconsolidated sediments that range in age from Holocene to Miocene. The oldest (Miocene) sediments that outcrop in the coastal area consists of consolidated light gray to variegated and mottled consolidated clays inter-bedded with sand and gravel zones. The sand and gravel strata contain water under artesian pressure and are a major aquifer in the coastal area. the Miocene section ranges from several hundred to possibly several thousand feet thick. The Pliocene age Citronelle Formation unconformably overlies the Miocene deposits. The Citronelle Formation consists predominantly of reddish brown to orange and yellow gravelly sand. Interspersed in the gravelly sand are lenses and partings of gray, orange, and brown sandy clay. The thickest of the Citronelle Formation varies from a few tens of feet ir northern Mobile County to as much as 200 feet in the vicinity of Dauphin Island. Semi-consolidated to unconsolidated sediments (sand, silty sand, clay sand, and clay) of Pleistocene and Holocene age overlay the Citronelle Formation in Mississippi Sound. These sediments are several tens of feet thick and constitute the majority of the material which would be encountered in the considered project improvement at Portersville Fay.
- 12. <u>CLIMATE</u>. The study area has a humid, temperate to subtropical climate, although occasional subfreezing temperatures

occur. Air temperatures are influenced by the Gulf of Mexico, with average annual temperatures ranging between 60-70° Fahrenheit. Summer temperatures are influenced by the Bermuda High, a semipermanent high-pressure cell that extends over portions of the Gulf of Mexico near 30° North latitude. During the summer, southerly winds generated by the high-pressure cell have a high moisture content which tends to keep coastal temperatures lower than those of inland areas. Summer temperatures range from a low of 70° F to a high of 90° F. In the winter, winds are northerly and move in cold, continental air masses. Temperatures remain relatively mild, ranging from lows in the 40's to highs in 60's F.

- 13. The normal annual rainfall within the study area is among the highest in the United States, averaging between 55 to 64 inches. Rainfall is fairly evenly distributed over the year, being greatest during the thunderstorm season in July, averaging 7.6 inches, and least in October and November, averaging 3.5 inches. Thunderstorm frequency is one of the highest in the United States. Relative humidity is fairly constant throughout the day and year. Humidity is usually highest between 2400 and 0600 hours (83%), and lowest between 1200 and 2000 hours (62%).
- 14. <u>TIDES</u>. Tides in the area are diurnal. There are no tide recording gages at Bayou LaBatre or Bayou Coden. Based on tide gages located at Dauphin Island, Alabama, just east of the study area, and Pascagoula, Mississippi located to the west of the study area, the mean tidal range in Portersville Bay is about 1.33 feet. The extreme tide, except during storms, is 1.7 feet NGVD. The following tidal data shown in Table 1, refers to National Geodetic Vertical Datum (NGVD) of 1929:

Table 1

Tide Levels

	Elevation (Ft-NGVD)
Mean Lower Low Water (MLLW)	-0.33
Mean Low Water (MLW)	-0.33
Mean Tide Level	+0.34
Mean High Water (MHW)	+1.00

- 15. STORMS. The central Gulf of Mexico is one of the more hurricane vulnerable locations along the coastline of the United States. Records of tropical disturbances for the central gulf coast have been compiled sine 1872. Since 1872, 84 tropical disturbances with winds intensity greater than 34 knots have directly affected the central Gulf of Mexico coastline between Panama City, Florida and New Orleans, Louisiana. Of that number, 42 are known to have reached hurricane intensity. The vulnerability of the central gulf coast to hurricanes is well documented in the weather records. Over the 117-year period of record (1872-1989), the longest span of consecutive seasons without a hurricane striking the central gulf coast has been six years (1918-1923, inclusive).
- 16. Storm Surge elevations for Hurricanes Camille (1969) and Frederic (1979), two of the most severe tropical cyclones to have affected the study area, have been measured and are shown below in Table 2:

Table 2
Storm Surge Elevations

		e Elevation -NGVD)
Location	Camille	Frederic
Bayou LaBatre Bayou Coden AL 188 Bridge, Fowl River Heron Bay	8.5 8.3 7.3 6.6	9.9 8.9 9.4 9.0

17. <u>WINDS</u>. Although wind direction is variable throughout the year, the overall circulation pattern brings about prevailing northerly winds from September through February and southerly winds the remainder of the year. See Table 3.

Table 3

Mobile, Alabama Wind Data

	JAN	FEB	MAR	APR	MAY	JUN
Direction ¹	N	N	S	S	S	S
Velocity ²	8.0	8.2	8.4	8.3	7.7	6.9
	JUL	AUG	SEP	OCT	NOV	DEC
Direction ¹	SW	SW	N	N	N	N
Velocity ²	6.5	6.4	6.8	7.3	7.6	7.8

- Direction of prevailing wind.
- ² Average hourly wind velocity in knots.
- 18. The percentage of time that winds from 0 to 3 knots prevail is 13.8%. Winds less than 7 knots occur 32% of the time; winds less than 11 knots occur greater than 72% of the time; and winds less than 17 knots occur more than 94% of the time. The time attributable to winds of 17 knots (near 20 m.p.h.) or greater is less than 6%.
- 19. Additional wind data collected at Keesler Air Force Base, Biloxi, Mississippi, by the Air Weather Service, is similar to the data measured at Mobile. At Keesler, the percent of time the wind is calm is 10%; the percentage of time that winds less than 3 knots prevail is 15%; winds less than 12 knots occur greater than 85% of the time; and winds less than 24 knots occur 99.9% of the time.
- 20. WAVE ANALYSIS. A strong wind from the south or southwest will produce the most severe wave conditions in Portersville Bay. The fetch in this direction is limited to approximately 10 miles by the barrier islands located to the south of the study area; Dauphin Island, Petit Bois Island, and Horn Island. Isle Aux Herbes (Coffee Island), also provides protection from southwesterly winds. Thom's Fastest-Mile method for determining frequency of winds, as described in the U. S. Army Coastal Engineering and Research Center's (CERC) Shore Protection Manual (SPM), was used to determine the wind speed for various recurrence intervals. Since wave data are not available for

Portersville Bay, methods prescribed in the SPM were used to determine the characteristics of the waves affecting the shoreline for the various wind speeds determined previously. A constant approach depth of 6 feet was assumed. See Table 4 below.

Table 4
Wave Characteristics

Return Interval (Yrs)	Probability of Exceedance	Wind <u>Velocity</u> (MPH)	Wave <u>Height</u> (Ft.)	Wave <u>Period</u> (Sec)	Setup (Ft.)
2	0.5	27	1.5	2.8	1.4
5	0.2	33	1.6	3.0	2.1
10	0.1	40	1.8	3.2	3.1
20	0.05	47	1.9	3.4	4.3
50	0.02	58	2.2	3.7	6.5
100	0.01	66	2.4	3.8	8.5
200	0.005	76	2.5	4.0	11.2

21. Due to the relatively low crest elevation of the proposed shore protection measures, it is anticipated that the structure will be overtopped by waves on a fairly frequent basis during periods of strong southerly winds. When combined with a high tide and wind setup, a wave with a return of interval of 2 years will overtop the proposed structure. From a structural standpoint, the wave which will provide the greatest force against the wall would occur during a low tide, with a wave generated by approximately a 33 mph wind (5-year return interval), breaking and striking the wall. Based on the Miche-Rundgren method for determining non-breaking wave forces, a force of 500 pounds per linear foot of wall can be expected for a non-breaking wave. If that same wave were to break at the wall, the Minikin method for determining breaking wave forces yields a force of 1,600 pounds per linear foot of wall.

22. <u>SUBSURFACE INVESTIGATIONS</u>. Subsurface investigations for this project were conducted in June, 1989 and consisted of nineteen borings (PB-1-89 thru PB-19-89). All borings were

augured to a depth of -15 feet. The subsurface conditions at the project site are characterized by combination of silty sand (SM); clayey silt (ML) with some shell fragments in the upper strata, followed by inorganic clayey silt (MH) to the bottom of the holes. Groundwater encountered during the investigation ranged from a depth of 2.0 feet to 4.8 feet. The Geotechnical Report is provided in Appendix A at the end of this report.

- 23. PROBLEMS AND OPPORTUNITIES. The major problems at Portersville Bay stem from erosion along a 9,100-foot reach of the shoreline along the bay. The Shell Belt and Coden Belt roads run parallel to the shoreline, where each road is protected from the bay wave action by a timber seawall. The seawalls, which are located four to twelve feet from the shoulder of the roads, were constructed in the 1930's, and due to age, are starting to rapidly deteriorate. This deterioration, especially at the footings, is resulting in a loss of the backfill material which stabilizes the highway. Figure 2 is a drawing which shows the limits of the considered project improvement.
- 24. Mobile County frequently places fill material behind, and rubble (broken concrete, brick, asphalt, etc.) in front of the seawalls in attempts to abate the erosion. These efforts have not been successful as the material continues to erode into the bay due to the deterioration of the structures by tidal currents and wave action. If no action is taken, erosion will continue and further threaten the integrity of the highway, which could lead to complete loss of access to this area. Figures 3 and 4 provide a pictorial view of the condition at the considered project site. There is an opportunity for Federal and local interests to cooperate and solve a water and related land resource problem which threatens the integrity of the highway and subsequently the homes in this area.
- 25. STUDY CONSTRAINTS. Section 14 of the Flood Control Act of 1946, as amended, provides authority for the Corps of Engineers to undertake emergency construction, repair, restoration, or modification of streambank and shoreline protection works for the prevention of damage to public properties. Section 915 of the Water Resources Development Act of 1986 established the limit of Federal funding for an individual streambank and shoreline protection project at \$500,000. Cost in excess of this Federal limit must be assumed by the local sponsor. Since nonstructural measures would not prevent damage to the highway, such measures were not considered viable in meeting the Section 14 objectives.

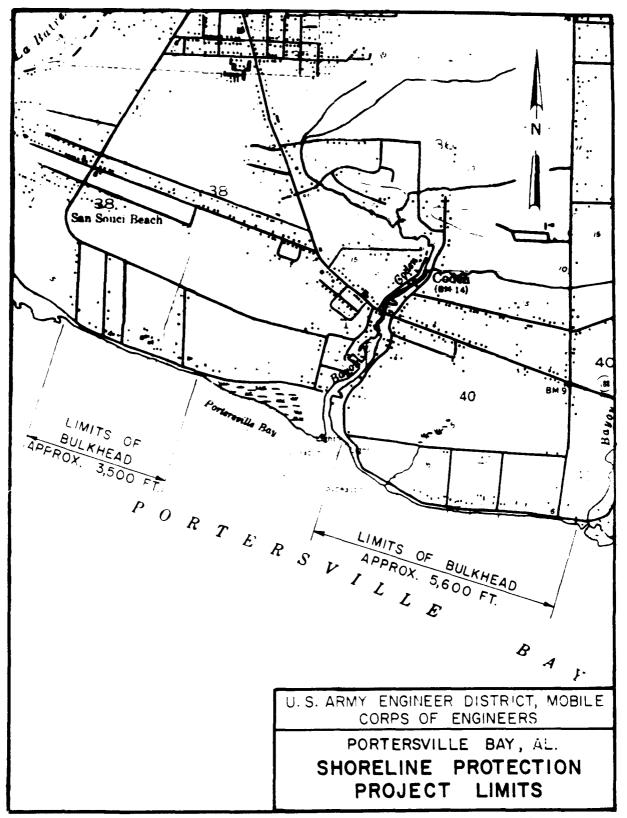
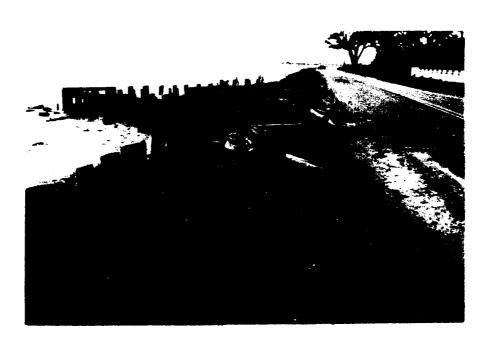


FIGURE 2



LOOKING EAST - DURING HIGH TIDE WATER WASHES OVER AND THROUGH OPENINGS IN DETERIORATED BULKHEAD.



LOOKING WEST - LOW TIDE EXPOSES DAMAGED BULKHEAD AND SHOWS STONE FILL USED TO REPLACE ERODED SOIL.

FIGURE 3



THIS SECTION OF THE BULKHEAD IN ITS EXISTING CONDITION PROVIDES LITTLE PROTECTION AGAINST SHORELINE EROSION.



SHORELINE EROSION IS A CONTINUING PROCESS DESPITE PERIODIC EFFORTS TO REPLACE SOIL WITH FILL MATERIAL.

FIGURE 4

PLANNING OBJECTIVES

- 26. NATIONAL OBJECTIVE. The planning process utilized in this study is consistent with the Water Resource Council's Economic and Environmental Principles and Guidelines (P&G). The P&G requires that all Federal and Federally assisted water and related land activities be planned for positive contribution to National Economic Development (NED) while protecting the Nation's environment. NED is to be achieved by increasing the net value to the United States output of goods and services and improving national economic efficiency.
- 27. The Corps of Engineers' implementation of P&G is accomplished through conformance to an objective and professional analysis of water resources problems and alternative solutions. In this study, an evaluation was made of the adequacy of various water resources management plans following several guidelines to insure that proposed activities are in the best public interest. These guidelines are briefly described as follows:
- o A full range of alternative solutions to a problem, including positive and negative features, are considered from the study's inception;
- o The "with" and "without" conditions of each alternative solution are determined;
- o The flexibility of each solution to meet changing national priorities and values is determined insofar as is possible;
- o The cumulative effects, both adverse and beneficial, of each alternative solution are continuously analyzed as a guide to decision making; and,
- o Feasible plans are in consonance with long-range development goals of local, regional, state and Federal objectives.
- 28. STUDY OBJECTIVE. In order to adequately proceed with formulation of an efficient plan and to properly consider the plan's impacts, the following planning objectives were established for the study:
- o Contribute to the maintenance, preservation, and protection of the highway along Portersville Bay by providing shoreline protection measures;

- o Contribute to the maintenance, preservation, and protection of the archeological and historical resources in the immediate area of Portersville Bay; and
- o Contribute to the maintenance, preservation, and protection of the environment in the immediate area of Portersville Bay.

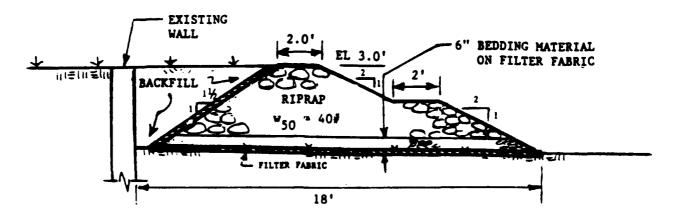
Alternative Plans

- 29. Guidance contained in Engineering Manual 1110-2-301 (Beach Erosion Control and Shore Protection), EM 1110-2-1614 (Design of Coastal Revetments, Seawalls, and Bulkheads), along with existing guidelines developed by the Mobile District were used to assist in design of the structural alternative plans. The structural alternative plans, as discussed below, would provide a permanent, complete, and acceptable solution to the erosion problems along the shores of Portersville Bay.
- 30. In view of the existing conditions, and the desire of Mobile County for corrective measures to stabilize the shoreline at Portersville Bay, four alternative plans were considered, including that of "No Action" (which is alternative 1). The "No Action" alternative is a valid course to be considered in lieu of impacts of structural improvements. This alternative, however, does not provide a solution to the existing problems, and would permit active shoreline erosion to continue until failure of the seawall and the highway occurred.
- 31. The three structural alternative plans were evaluated and compared on an equal basis early in plan formulation. The following elements are constant among each of the structural alternative plans:
- o Each plan would be constructed on the bay side of the existing timber bulkhead.
- o The area between the existing bulkhead and the replacement structure would be backfilled with a pervious material and seeded.
- o The drainage pipes which extend to Portersville Bay through the existing bulkhead will have to be extended through any replacement structure.

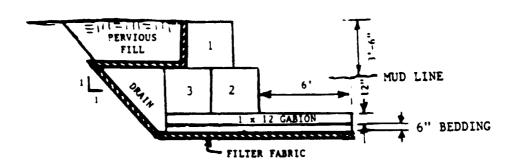
- 32. ALTERNATIVE 2. Alternative 2 is a structural shoreline protection plan consisting predominately of riprap revetment protection of the eroding streambank and shoreline. The riprap revetment would consist of 8,200 cubic yards of graded stone (W50=40#) placed over 6 inches of bedding material (2,450 cubic yards). The bedding material will be placed over a layer of filter fabric (22,510 square yards). Top elevation of the revetment would be 3.0 feet, and extend approximately 18 feet from the existing seawall into Portersville Bay. The area behind the riprap will be backfilled with 4,250 cubic yards of pervious material and seeded. The estimated first cost and annual cost for this plan is given in Table 5, and a typical cross section of the plan design is shown in Figure 5.
- 33. ALTERNATIVE 3. Alternative 3 is a structural shoreline protection plan consisting predominately of gabion revetment to eliminate the erosion problem. The gabion revetment would be constructed by placement of 12,720 cubic yards of small stones in 1' x 12' gabion baskets. A 6-inch layer of bedding material (1,970 cubic yards) will be placed over a layer of filter fabric (20,540 square yards). To provide a smooth uniform surface area for the considered gabion revetment, excavation of 11,740 cubic yards of dredged material would be required. The estimated first cost and annual cost for this plan is provided in Table 6, and a typical cross section of the plan design is also shown on Figure 5.
- 34. ALTERNATIVE 4. Alternative 4 considers construction of new timber bulkheads located three feet in front (bay side) of the existing bulkheads. The bulkheads would be constructed using 12-inch diameter, 12-foot long vertical piles (21,120 linear feet). The treated timber sheeting (140,800 board feet) will be backed by non-woven filter fabric (8,830 square yards). The estimated first cost and annual cost for this plan is provided in Table 7, and a typical cross section of the plan design is shown on Figure 6.
- 35. <u>COMPARISON OF ALTERNATIVES</u>. All costs and benefits are compared on an average annual equivalent basis. Annual charges include interest and amortization of first costs and operation and maintenance of the improvement for a 50-year project life. An interest rate of 8 7/8 percent is used in both the cost and benefit analyses. The summary comparison of the first costs, annual charges, and annual benefits for each of the alternatives is displayed in Table 8.

TABLE 5
ALTERNATIVE 2 - RIPRAP
OCT. 1989 PRICES - 8 7/8%

	:=====:	=======	unit Unit	Total
Description	Qty	Unit	Cost	Cost
=======================================	======	=======	=======	=========
FEDERAL:				
Riprap	8200	су	43	\$353,000
Bedding Material	2450	СУ	35	86,000
Filter Fabric	22510	зy	3	68,000
Earth Backfill	4250	сy	3	13,000
Seed & Mulch	2.3	ac	2000	5,000
Culvert Extension	16	ea	700	11,000
Remove Rubble	980	су	3	3,000
Subtotal Construction				\$539,000
Contingencies (25%)				135,000
Total Construction Cost				\$674,000
Engineering & Design		ls		54,000
Supervision & Administration		ls		40,000
Supervision & Administration		10		
TOTAL PROJECT FIRST COST				\$768,000
Interest During Construction				8,600
Total Investment Cost				\$776,600
Interest and Amortization				\$70,000
Total Federal Annual Cost				\$70,000
NON-FEDERAL:				
Annual O&M Cost				\$7,100
Interest During Construction				400
Total Non-Federal Annual Cos	st			\$7,500
TOTAL PROJECT ANNUAL COST				\$7 7,500
TOTAL ANNUAL BENEFITS				\$116,400
TOTAL ANNUAL DENEFITS				•
BENEFIT/COST RATIO				1.50
NET ANNUAL BENEFITS				\$38,900
=======================================	======	======		=========



PORTERSVILLE BAY
RIPRAP REVETMENT SECTION



PERVIOUS FILL, $\phi = 30^{\circ}$, c = 0# BACKFILL = 120 #/FT³

F_V= $\frac{1}{2}$ H² K_V, F_H= $\frac{1}{2}$ H² K_H

FOR TYPE 2 SOILS, $K_V = 15\#/FT^2/FT$ $K_H = 40\#/FT^2/FT$

PORTERSVILLE BAY

GABION REVETMENT SECTION

FIGURE 5

TABLE 6
ALTERNATIVE 3 - GABIONS
OCT. 1989 PRICES - 8 7/8%

	=======================================	======			
ITEM Description	Qtv	Unit	Unit Cost	Tctal Cost	
Description		_			
FEDERAL:					
CABIONS	12720	су	100	\$1,272,000	
Bedding Material	1970	су	35	69,000	
Filter Fabric	20540	Вy	3	62,000	
Excavation Earth Backfill	11740 14370	СУ	3 3	35,000 43,000	
Seed & Mulch	1.4	a.c	2000	3,000	
Culvert Extension	16	ea.	700	11,000	
Remove Rubble	980	СУ	3	3,000	
Subtotal Construction				\$1,463,000	
Contingencies (25%)				366,000	
Total Construction Cost				\$1,829,000	
Engineering & Design		ls		146,000	
Supervision & Administration		ls		110,000	
TOTAL PROJECT FIRST COST				\$2,085,000	
Interest During Construction				92,200	
Total Investment Cost				\$2,177,200	
Interest and Amortization				\$196,000	
Total Federal Annual Cost				\$196,000	
NON-FEDERAL:					
Annual OlM Cost				\$11,800	
Interest During Construction				500	
Total Non-Federal Annual C	ost			\$12,300	
TOTAL PROJECT ANNUAL COST				\$208,300	
TOTAL ANNUAL BENEFITS				\$116,400	
BENEFIT/COST RATIO				0.56	
NET ANNUAL BENEFITS				(\$91,900)	

TABLE 7 ALTERNATIVE 4 - TIMBER BULKHEAD OCTOBER 1989 PRICES - 8 7/8% NED PLAN

NED PLAN					
=======================================	=======	==========			
ITEM			Unit	Total	
Description	Qty	Unit	Cost	Cost	
=======================================	=======	========	:::::::::::::::::::::::::::::::::::::::	======	
FEDERAL:					
n:3	1700		105	#227 COO	
Pile	1760	6 a	135	\$237,600	
Lumber	140800	bd/ft	0.6	84,500	
Filter Fabric	8830	sу	3 3	26,500 12,800	
Earth Backfill	4250 1.4	СУ	2000	2,800	
Seed & Mulch Culvert Extension	16	ac	400	6,400	
Remove Concrete	10	e a	400	0,400	
Rubble	980	су	3	2,900	
RUDDIE	300	Cy	J _	2,500	
Subtotal Construc	etion		_	\$373,500	
Contingencies (25%)	ı			93,400	
Total Construction	on Cost			\$466,900	
	•	1		27 400	
Engineering & Desig		ls		37,400	
Supervision & Admir	istratio	ls		28,000	
TOTAL PROJECT FIRST	COST			\$532,300	
Interest During Cor	struction			5,900	
Total Investment	Cost			\$538,200	
Interest and Amorti	zation			\$48,600	
Total Federal Ann	ual Cost			\$48,600	
Non-Federal:					
Annual O&M Cost				\$12,900	
Interest During Cor	struction			600	
Total Non-Federal	Annual C	ost	_	\$13,500	
TOTAL PROJECT ANNUA	L COST			\$62,100	
TOTAL ANNUAL BENEFI	TS			\$116,400	
BENEFIT/COST RATIO		•		1.87	
NET ANNUAL BENEFITS	3			\$54, 300	
=======================================	:=======	=========		=========	

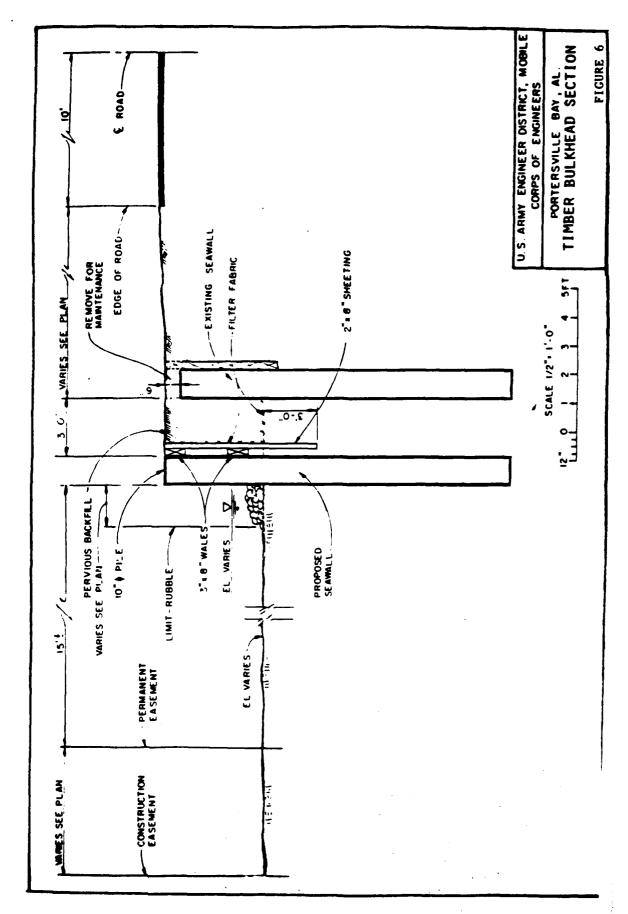


TABLE 8
COMPARISON OF ALTERNATIVES

Alterna- tive	First Cost	Annual Charges	Annual Benefits	BCR	
=======================================	=======================================	=======================================	=======================================		
2 (Riprap)	\$768,000	\$77,500	\$116,400	1.50	
3 (Gabions)	\$2,085,000	\$208,300	\$116,400	0.56	
4 (Timber Bulkhead)	\$532,300	\$62,100	\$116,400	1.87	

36. As indicated in Table 8, alternative plan 4 (timber bulkhead) would yield the maximum net economic benefits for the for the resources expended and would be the most cost effective of the considered plans. The timber bulkhead represents the optimum level of economic development and it is also the plan most preferred by the local sponsor. Accordingly, the timber bulkhead alternative is designated the NED Plan, and therefore, it was developed in greater detail. The riprap, and gabion revetment alternatives were summarily dropped from further consideration. A more detailed analysis and cost estimate of the NED plan is provided in Table 9, and the cost estimate in Code of Cost Accounts format is in Appendix D.

TABLE 9
FIRST COST - TIMBER BULKHEAD
OCT. 1989 PRICES - 8 7/8%
NED PLAN

	NED	PLAN		
	=======			:=======
ITEM			Unit	Total
Description	Qty	Unit	Cost	Cost
	========	=========	===========	========
CONSTRUCTION:				
Prep. Work				
Mob. & Demob.	job	ls		\$5,000
Hobi a bemoo.	,05	1.0		40,000
Seawalls:				
Timber Pile	27300	1 f	7.5	204,800
	21300	11	(• 0	204,000
Timber Bulkhead	124200	L.C	0.05	107 000
& Whales	134300	b f	0.95	127,600
Bolts	24100	lbs	1 2 7 5	24,100
Filter Fabric	6600	зy	2.75	18,200
General Items:				
Cut Existing Pil	1960	1f	6	11,800
Sheeting Boards	12000	bf	0.5	6,000
Rem Concrete Rub	2100	су	10	21,000
Debris Removal	300	СУ	5	1,500
Compacted Backfi	4400	су	5	22,000
Seed & Mulch	8	ac	1800	14,400
Subtotal Construction	on			\$456,400
Contingencies (25%				114,000
00.101.160.1010.0 (10)0				
Total Construction				\$570,400
Total constituetion				\$570,400
Planning, Eng. & Des	a i dn	ls		\$50,00 0
				34,000
Construction Manager	nent	ls		34,000
momat governmenton	300 m			ACEA 400
TOTAL CONSTRUCTION	COST			\$654,400
LERRD:				
Const. Staging Are		ac	20 0 0	\$8,000
Relocate Finger P				10,000
Electrical keloca	tion 1	job	ls	2,000
'Seawall Drainage				
"12" Drain Pipe	6	1 f	26	200
"15" Drain Pipe	12	lf	32	400
"12" Drain Pipe	27	1 f	38	1,000
"12" Drain Pipe	27	1 f	48	•
				-,
Contingencies (25%)				6,500
Planning Eng. & Des	i ơn	ls		2,000
Construction Manager		.ls		1,000
Construction manage	ucli c	13		1,000
Total IEDAN				#20 #00
Total LERRD				\$32,400
TOTAL DOCUMENT STROM	COCE		•	*COC 000
TOTAL PROJECT FIRST				\$686,800
	========	=======================================	==========	=======

TABLE 9 Cont.

ANNUAL COST - TIMBER BULKHEAD OCT. 1989 PRICES - 8 7/8% ANNUAL COST - NED PLAN

Item	Amount
CONSTRUCTION:	
Total Construction Cost Interest During Construction	\$654,400 7,300
Total Investment Cost	\$661,700
Interest and Amortization	60,000
Total Annual Project Cost	\$60,000
	•
LERRD:	
First Cost Interest During Construction	\$32,400 700
Total Investment Cost	\$33,100
Interest and Amortization Annual Maintenance Cost	\$3,000 12,900
Total Annual Cost LERRD	\$15,900
TOTAL ANNUAL CHARGES	\$75,900
TOTAL ANNUAL BENEFITS	\$116,400
BENEFIT/COST RATIO	1.5
NET ANNUAL BENEFITS	\$40,500

ECONOMIC ANALYSIS

- 37. Existing Conditions. The constant wave attacks against the shore line and seawalls at Portersville Bay are eroding land and threatening the roadway access for both segments of road; Coden Belt Road to the east, and Shell Belt Road to the west.
- 38. Attempts by Mobile County to provide interim protection have met with only marginal success, despite incremental expenditures of \$237,000 on maintenance and repairs during the 9-year period, 1979 through 1987, necessitated by the existing bulkhead's deteriorated condition. The existing bulkheads have been breached intermittently along their entire lengths. Backwash has eroded the material from behind the bulkheads. This condition is threatening to undermine the bulkheads, culverts, adjacent roads, bridges, and utility poles. For evaluation purposes it is assumed that failure of both roads will occur within two years.
- No Action Alternative. The "no action alternative" is based on the assumption that no Federal, State or local protection would be provided. Under these conditions, an unalterable series of event would take place. With the failure of the bulkheads, adjacent roadbeds would erode at increased rates, resulting in their eventual failure. Without stable support, utility poles located between the roadbed and the water would eventually collapse. Without protection, two ten-ton limit bridges located at either end of the Coden Belt Road would eventually fail, as would a four-ton limit bridge on Shell Belt Road. Natural gas and water pipelines situated north of and adjacent to the existing road would also eventually be rendered inoperable. Access to private property and to public beaches and a public park would be limited or denied, entirely. Ultimately, private residential structures adjacent to and north of the roads would be endangered.
- 40. Because of the nature and location of the problem at Portersville Bay, "No Action" is not considered a realistic alternative to the proposed Federal project. It is reasonable to assume that some measure of protection would be provided by local interests prior to completion of the chain of events just described, as evidenced by the level of protection provided since 1979.

- 41. No Federal Action. Under the "No Federal Action" alternative, the current level of protection would continue to be provided by the non-Federal interests until the seawalls and roads fail, two years hence. Given such an occurrence, local, county, and state agencies face at least two obvious alternatives: A) rebuild to the conditions existing immediately prior to failure and protect the reconstructed roadway; or B) allow continued erosion beyond failure of the existing structures and provide permanent alternative access routes to the residential property and park.
- 42. Alternative A. Rebuilding to conditions existing prior to failure considers two further reasonable options available to local interests, the choice of which is determined by their relative annualized costs:

Option a. Rebuild the bulkheads and roads at their current locations, using fill to rebuild the washed out roadbed and beach front; or

Option b. Build equivalent replacement bulkheads and roads north of, adjacent to, and parallel to the sites of existing seawalls and roads.

43. Either of the two options just described would entail certain common costs. Existing seawalls and roads would require continued maintenance at the current level for the two-year period prior to failure. Road construction costs, including costs for engineering, inspection, underlayment, drainage, and adjustments to private and public property and structures adjacent to the new road are assumed equivalent under both conditions. Three existing bridges and 60 utility poles and

Where necessary, annualized costs are reduced to their present value using the same discount rate. The time period for the present valuation is the assumed duration of time prior to the commencement of each activity. A detailed description of the methodology and the computations for economic benefits are contained in Appendix B.

lines would be replaced at the time of failure. The failed seawalls would have to be replaced to protect the newly-constructed roadways. Road construction and replacements of bridges, utility poles, and seawalls are estimated to take one year to complete. This would necessitate the temporary closure of the two roads and the consequent costs of rerouting local traffic, and the construction, placement and maintenance of signs and barriers.

44. Annual costs common to both options are as follows:

1.	Maintenance to time of failure	\$	4,173
2.	Road construction		40,103
3.	Bridges Replacement		4,152
	Replacement of utility poles and lines		1,609
5.	Rerouting local traffic		3,242
6.	Construction, placement, and maintenance	ce	
	of temporary signs and barriers		1,139
7.	Rebuilding seawall		41,546
	Total Common Annual Benefits	:	\$95,964

- 45. In addition to those costs common to both options, Option a would require the additional costs of placing approximately 18,333 cubic yards of fill at the Shell Belt Road site and approximately 30,556 cubic yards of fill at Coden Belt Road.
- 46. Additional annual benefits under Option a include:

Common Annual Costs	\$95,964
Fill to original codition	20,423
Total Annual Costs Option a	\$116,387

47. Option b, building north of and adjacent to existing structures, would require no additional fill beyond that used in the construction of the replacement road, but would entail other

² Protection provided for the road by the newly-constructed seawalls is assumed to be comparable in cost and construction to that provided by the proposed Federal project and would also have an estimated 50-year life expectancy.

additional costs. New 50-foot rights-of-way through expensive beach front private property north of and adjacent to the existing roads would have to be acquired at additional cost to the local interests. Water and natural gas pipelines, currently positioned north of the existing roads along existing rights-of-way, would have to be relocated.

48. Annual economic costs under Option b includes:

8.	Common Annual Costs	\$95,964
9.	Acquisition of rights-of-way	72,295
10.	Relocation of natural gas and water pipelines	15,190
	Total Annual Costs, Option b	\$183,449

- 49. Therefore, after comparing the total costs of the two options, it is conclusive that the costs to implement Option a is significantly less than the costs to implement Option b.

 Accordingly, Alternative A, Option a would be the most rational economic choice.
- 50. Alternative B. Providing permanent alternative access assumes that deterioration of the project site would be allowed to continue beyond the point of failure of the seawalls and roads and that public maintenance of exiting waterfront structures would cease at the time of failure. An alternate equivalent road would then be constructed parallel to the existing road, approximately 350 feet to the north, to provide rear approach access to the private residences facing south along the existing road.
- 51. Under this alternative, no action would be taken by local public interests after the failure of the existing seawalls to prevent further deterioration of private beach front property. Thus, it is assumed that landowners would provide protection at some point after failure, prior to endangerment of the private residences at the site. For evaluation purposes, it is assumed that construction of two-layer, 6-foot wooden bulkheads would be completed by private landowners within 10 years after failure and that construction would be distributed evenly across that time period. Traffic would be permanently rerouted (that is, for the full 50-year period of the project life); and more costly permanent signs and barriers would have to be constructed and maintained.

- 52. Construction of alternate roads would also require the acquisition of 50-foot-wide rights-of-way, approximately equal in length to the existing rights-of-way. Property acquired under this alternative project concept would be much less expensive than the beach front property which would be acquired under Alternative A Option b. However, the proximity of extensive wetlands and wildlife habitat to the area of this proposed alternative would likely increase the costs to complete the necessary environmental impact assessments and to ensure compliance with environmental regulations. Additional costs may also accrue to mitigation of disturbed wildlife habitat and wetlands.³
- 53. Additional costs for maintaining conditions, road construction, bridges replacement, replacement of utility poles and lines, and relocation of water and natural gas pipelines are determined to be equivalent to those described under Alternative A Option b. Providing for alternative access routes would include the following annual costs:

	Expenditures	Estimated	Annual C	<u>ost</u>
1.	Maintenance to time of failure		\$ 4,1	73
2.	Acquisition of rights-of-way		9,2	80
3.	Road construction		40,1	03
4.	Construction of one 10-ton limit b	ridge	1,3	84
5.	Relocation of natural gas and water pipelines	r	15,1	90
6.	Relocation of utility poles and li	nes	1,6	09
7.	Construction, placement, and maint of permanent signs and barriers		12,6	53

³ In the interest of time and expense, the cost of mitigation of adverse environmental impact was not evaluated. Evaluation of this category would serve only to increase the benefit-to-cost ratio.

8. Permanent road closure and rerouting local traffic

5,268

9. Construction of bulkheads along private beach front

43,131

Total Annual Cost

\$132,719

- 54. Without-Project Condition. As a result of comparison of annual costs associated with each alternative No-Federal-Action scenario, it was determined that Alternative A Option a is the most reasonable without-project condition scenario and will be used as the basis for the Federal project economic benefits determination.
- 55. With-Project Condition. Evaluation of the with-project benefits is premised upon the assumption that local interests must act immediately to prevent further deterioration of the seawalls and roads at the proposed project site. The with-project condition considers the immediate replacement and protection of the seawalls and repair of the adjacent roadbeds and surfaces. The proposed Federal project offers the least-cost solution to the erosion problem at Portersville Bay for the life of the project (50 years). Net annual benefits to replacement of the total length of the seawalls at the project sites would be the difference between the annualized cost of the NED plan, \$66,300, and that of its most likely alternative (Alternative A, Option a), \$116,400, for a net annual benefit of \$50,100.

ENVIRONMENTAL CONSIDERATIONS

56. Construction of the NED plan as described in Alternative 4 would cause minor short term negative impacts and long term beneficial impacts. Adverse impacts include the loss of about 0.61 acres of water bottoms along the shoreline where the bulkhead would be constructed. Beneficial impacts include the protection of the shoreline and highway from further erosion and the creation of good wality habitat for littoral flora and

fauna. An Environmental Assessment (EA) of the proposed plan was prepared in accordance with the provisions of the National Environmental Policy Act of 1969 and is provided following the main report. The Finding of No Significant Impact (FONSI), the Section 404(b)(1) Evaluation, and the Statement of Findings follow the EA.

- 57. Water Quality Certification and Coastal Zone Consistency. Pursuant to the requirements of the Clear Water Act, State Water Quality Certification is required for the proposed action. On December 1, 1989 the proposed project description was circulated for public comment by a 30-day public notice (Number FP89-BC03-4). By letter of December 12, 1989, the Alabama Department of Environmental Management (ADEM) was requested to issue Water Quality Certification (WQC) and Coastal Zone Consistency (CZC) Certification. ADEM issued State Water Quality Certification and Coastal Zone Management Certification on March 22, 1990.
- 58. <u>CULTURAL RESOURCES</u>. There are several recorded prehistoric shell middens in the vicinity of Bayou Coden. None of these will be affected by the proposed construction activities since the work area will be confined to the existing paved road adjacent to Portersville Bay and to the immediate area within the Bay. Mobile District archaeologists have determined that no properties listed on, determined to be eligible for, or being nominated to the National Register of Historic Places are located in the project vicinity. Concurrence on this determination and the proposed action has been received from the Alabama State Historic Preservation Officer (SHPO) and is included in the Statement of Findings, which follows the EA.

PROJECT DESIGN

The recommended project to be constructed at Coden Belt and Shell Belt roads is designed as a cantilever type bulkhead with an elevation of 3 1/2-foot. This design elevation, however, varies in some locations (see Figure 6). Support for this design was based on the stability of the existing bulkheads which have been in service many years and show no visible signs of The new bulkheads will be located three feet in front (bay side) of the existing bulkheads. The existing bulkheads will remain in place except for approximately the top 6 inches which will be cut off below backfill grade for maintenance purposes. Eighteen finger piers (as shown on Plates 1-11) will be detached from the existing bulkheads, by the local sponsor, prior to initiation of project construction. The local sponsor will reattach the finger piers to the new bulkhead after construction of the bulkheads is completed. Scheduling of this non-Federal action will be covered in the LCA.

- 60. The new bulkheads will consist of 2" x 8" vertical sheeting, $3" \times 8"$ wales, and 10" diameter piles. The sheeting is backed by a non-woven filter fabric and backfilled with pervious soil (sandy material). All timber will be pressure treated and the hardware will be hot dipped galvanized. The piles have a penetration depth of approximately 8 to 10 feet and, are spaced four feet center to center. The wales span from pile to pile with the vertical sheeting attached to them. The sheeting will penetrate three feet below the dredged line to prevent wave action from scouring the toe and undermining the bulkheads. The rubble presently located in front of the old bulkheads will be relocated in front of the new bulkheads to help prevent toe scour, and also to dissipate energy from small wave action. The new bulkheads are calculated to last for about 25 years, after which, the entire structure would be replaced. The replacement structure is calculated to last for an additional 25 years, bringing the total project life to 50 years. Annual maintenance costs for the project are calculated to be \$12,900, which is enough money to cover the replacement costs of the bulkhead.
- 61. Design Loads. Forces acting on the bulkheads were calculated from the soil parameters furnished by the Geotechnical and Materials Branch of Mobile District. A one foot head differential was assumed betweer the backfill saturation line and the bay pool elevation due to the fluctuation of the tide and wave action. Active and passive soil pressures were used in designing the bulkhead members and performing the stability analysis. Forces from the wave action acting on the structures are not critical. Because the bulkheads are relatively small in height, it is anticipated that the structures will be overtopped by the large waves. Therefore, the forces of these waves would go over and not impact the bulkheads. Small wave forces impacting the bulkheads will be insignificant since the forces will be acting opposite to that of the backfill pressures.

PLAN IMPLEMENTATION

62. In accordance with cost sharing requirements as specified by the Water Resources Development Act of 1986, non-Federal interests will pay 25% of total project costs including 5% in cash. Should the non-Federal contribution (5% cash and LERRD) be less than 25%, the non-Federal interests shall pay an additional amount in cash during construction to bring the total non-Federal contribution up to 25%. Additionally, non-Federal interests shall assume responsibility for all cost in excess of the Federal limitation of \$500,000. Mobile County, Alabama, is the local sponsor for the considered project. Implementation of the NED Plan includes the first cost for lands, easements, rights-of-way,

relocations, and dredged material disposal areas (LERRD); construction, designs, plans and specifications, and operation and maintenance. The cost of design, plans and specifications and project construction are borne by the Federal government, up to a maximum expenditure of \$500,000. The cost of all LERRD, operation and maintenance, and all construction costs above \$500,000 are to be borne by the local sponsor. Allocation of project cost between the Federal government and the local sponsor is displayed in Table 10.

TABLE 10

FEDERAL AND NON-FEDERAL COST APPORTIONMENT
TIMBER BULKHEAD - NED PLAN

	Federal Share	Non-Federal Share
Total Construction (\$686,800)	\$ 500,000	\$154,400
LERRD	0	\$32,400
Total	\$500,000	\$186,800
=======================================	=======================================	

INSTITUTIONAL REQUIREMENTS

63. Before the NED Plan can be constructed and function to provide streambank and shoreline protection, a number of specific actions must be completed by both the Federal Government and the local sponsor. The Federal Government would be responsible for the construction of the NED Plan. The Corps of Engineers would prepare the final design, prepare detailed plans and specifications, and supervise and administer the necessary

construction contracts. The Corps would also periodically inspect the completed project to assure that it would function to fulfill the intended purpose. In addition to these responsibilities, the Corps must first assure that the proper review, approval, and local sponsor responsibilities are fulfilled. The events shown in Table 11 are planned prior to the start of any construction.

TABLE 11

EVENTS PRIOR TO CONSTRUCTION

p.	====== xpected
-	etion Date
The Mobile District submits the report to the South Atlantic Division for review and requests funds for preparation of plans and specifications	May 1990
The South Atlantic Division approves the report for technical adequacy and forwards it to the Office Chief of Engineers with a request for funding for plans and specifications	Aug 1990
The Mobile District prepares plans and specifications while coordinating with the local sponsor on the draft Local Corporation Agreement (LCA)	Sep 1990
When the plans and specifications are essentially completed by the Mobile District, the draft LCA agreement is submitted to the Office of the Chief of Engineers with a request for approval of construction and authority to advertise for a construction contract	Oct 1990
A fact sheet on the project is sent to the Assistant Secretary of the Army (Civil Works) with a recommendation for inclusion of the project in the construction program	Oct 1990

The Assistant Secretary of the Army (Civil Works) authorizes the Office of the Chief of Engineers to allocate funds for construction of the Project and the Office of the Chief of Engineers approves the project

Nov 1990

The LCA agreement is signed and the local sponsor executes preconstruction commitments

Dec 1990

The construction contract is awarded

Jan 1991

- 64. The appropriate contractual agreement for providing lands, rights-of-way, and cost sharing, must be in effect prior to any Federal construction being initiated. The LCA, to be entered into by the local sponsor with the Secretary of the Army, would specify all the project related responsibilities of the non/Federal interest. This agreement would contain the following requirements:
- o Provide without cost to the United States all lands, easements, and rights-of-way and utility relocations and alterations required for construction and future maintenance of the project;
- o Hold and save the United States free from damages due to the construction works except damages due to the fault or negligence of the United States or its contractors;
- o Maintain and operate the project after completion without cost to the United States in accordance with regulations prescribed by the Secretary of the Army;
- o Assume full responsibility for all project costs in excess of the Federal cost limitation of \$500,000;
- o Prevent future encroachments which might interfere with proper functioning of the project;
- o Fulfill the applicable requirements of non-Federal cooperation as specific in the terms and conditions of the

Uniform Relocation Assistance Real Property Acquisition Policies Act of 1970 (Public Law 91-646). approved January 23, 1971; and

- o Comply with Section 601 of Title VI of the Civil Rights Act of 1964 (Public Law 88-352) which says that no person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied, the benefits of, or be subject to discrimination under any program or activity receiving Federal financial assistance.
- 65. A draft LCA has been coordinated with Mobile County. A copy of the county's letter of authority and intent to cooperate with the Federal government on the streambank and shoreline protection project at Portersville Bay in Bayou Coden, Alabama, is provided in Exhibit 1 in the back of this report.

CONCLUSIONS

- 66. As District Engineer, Mobile District Corps of Engineers, it is my duty in the role as responsible Federal official, to review and evaluate in the overall public interests, the economic and environmental effects of streambank and shoreline stabilization to protect the highway and homes at Portersville Bay, Bayou Coden, Alabama.
- 67. After weighing all factors involved in the proposed actions, I have concluded that the environmental impacts associated with the plan, described herein as Alternative 4, would not adversely affect the quality of the human environment. I further find that the selected plan for emergency streambank and shoreline protection has the highest net economic development benefits consistent with protection of the environment, and is, therefore, designated as the NED Plan. The selected plan is complete and effective in solving the erosion problems and in realizing the available opportunities. The first cost of the selected plan is \$686,800, and the local sponsor's share would be \$186,800. The benefit-to-cost ratio is 1.5 to 1, and the selected plan is acceptable to the local sponsor and all reviewing agencies.

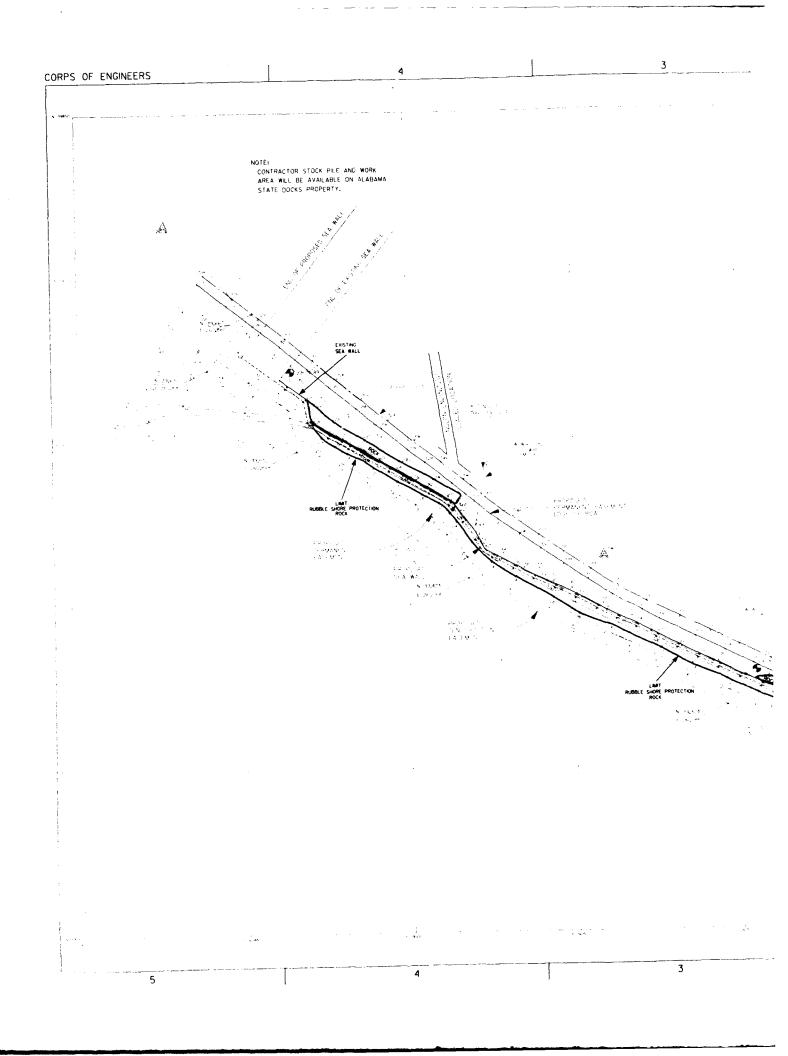
RECOMMENDATION

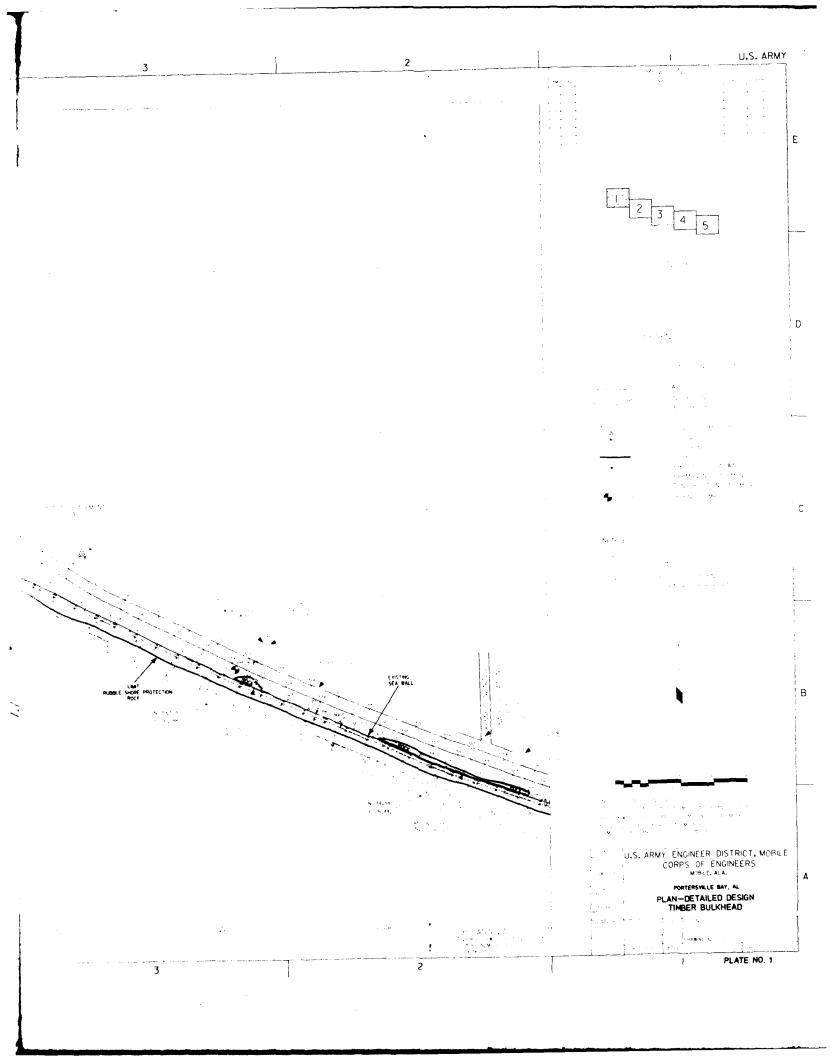
68. I recommend that the construction of a streambank and shoreline protection project at Portersville Bay in Bayou Coden, Alabama, at a presently estimated total first cost to the United States of \$500,000, and in cooperation with Mobile County, Alabama, generally in accordance with the NED Plan and conditions of local cooperation described in this report be undertaken under the authority provided by Section 14 of the Flood Control Act of 1946, as amended.

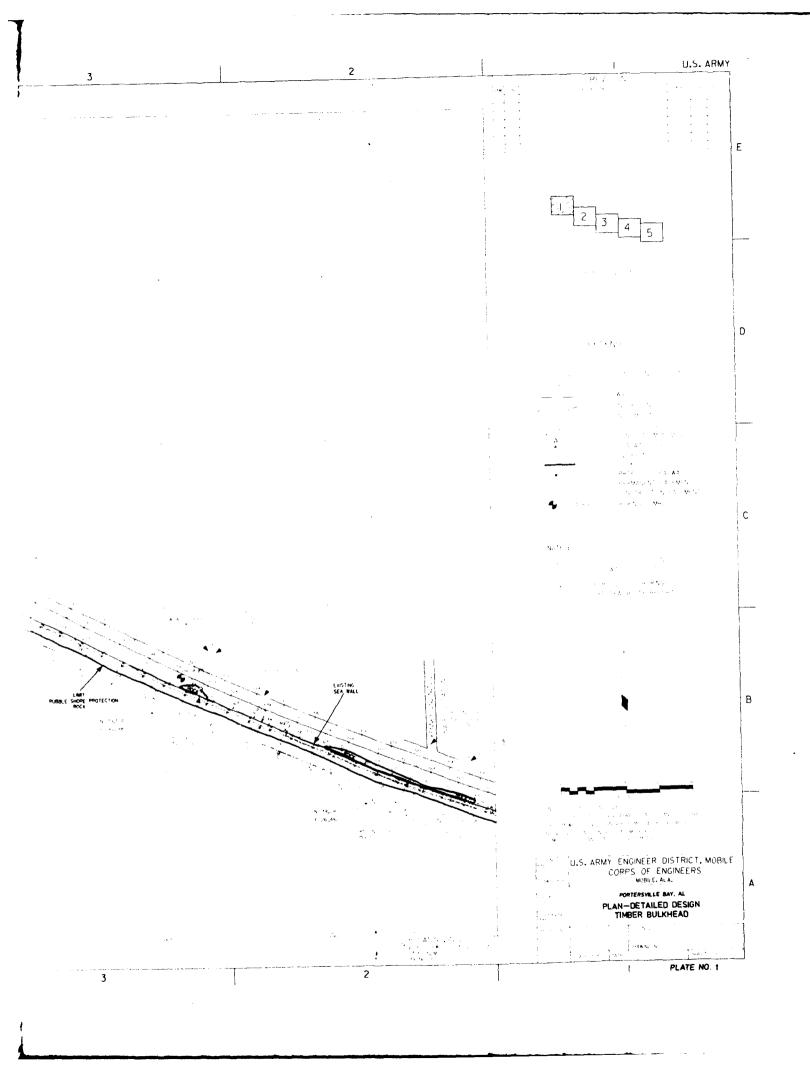
Larry S. Bonine

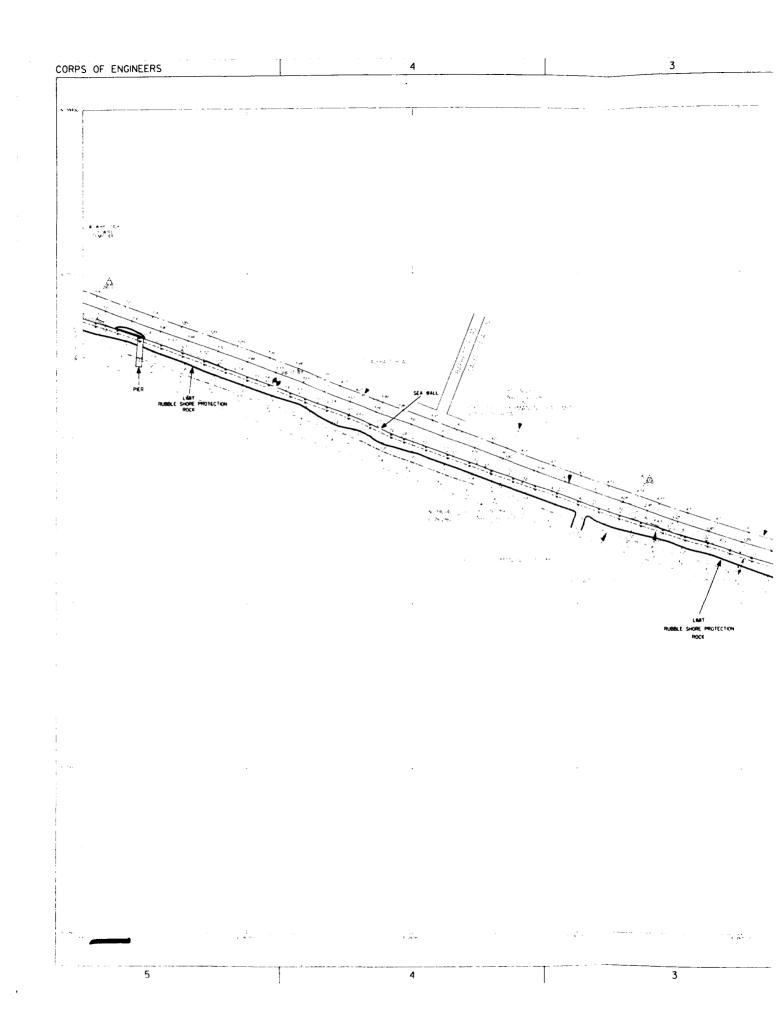
Colonel, Corps of Engineers

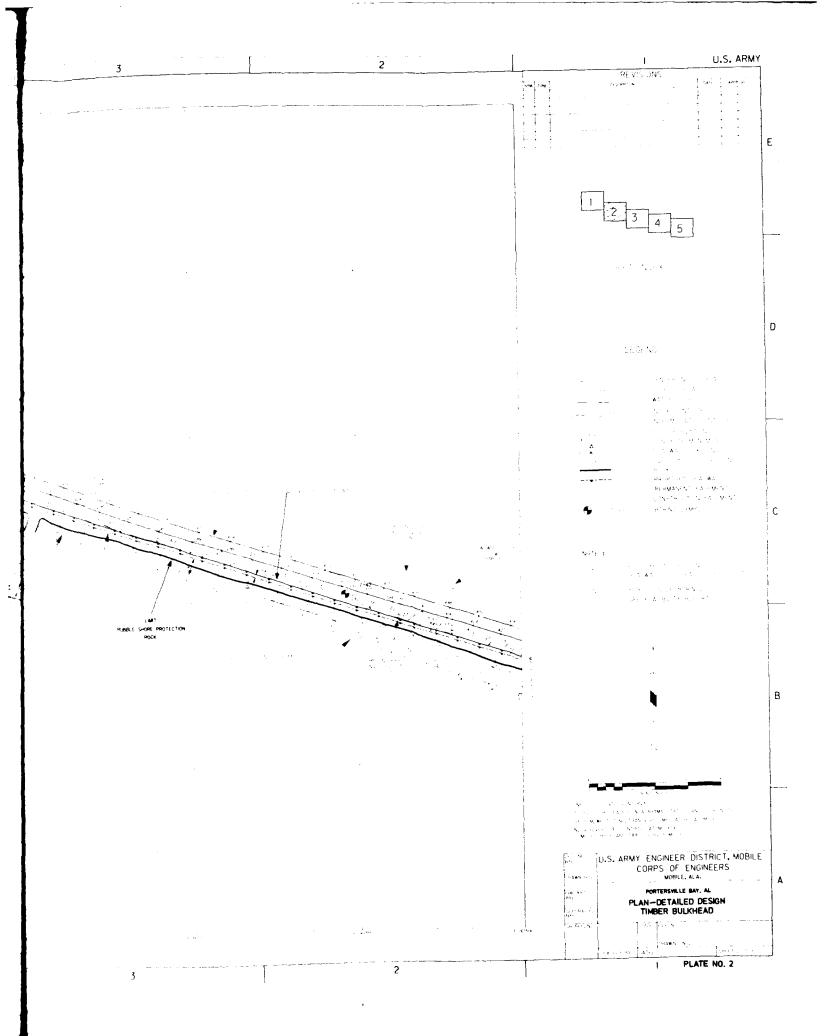
District Engineer

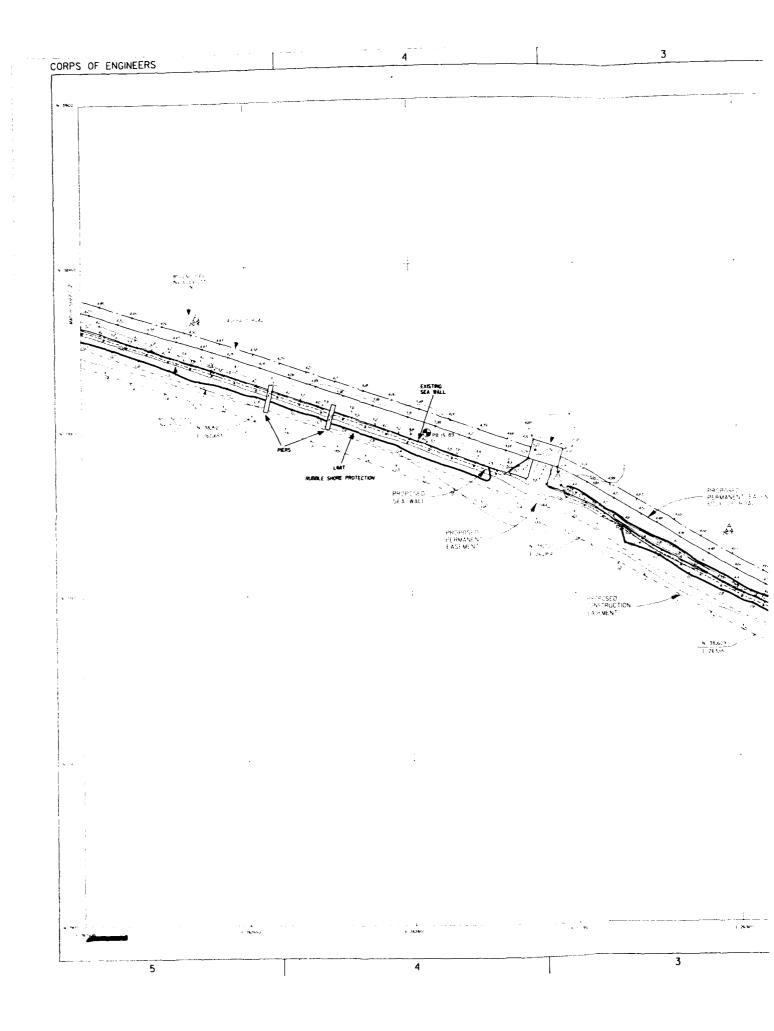


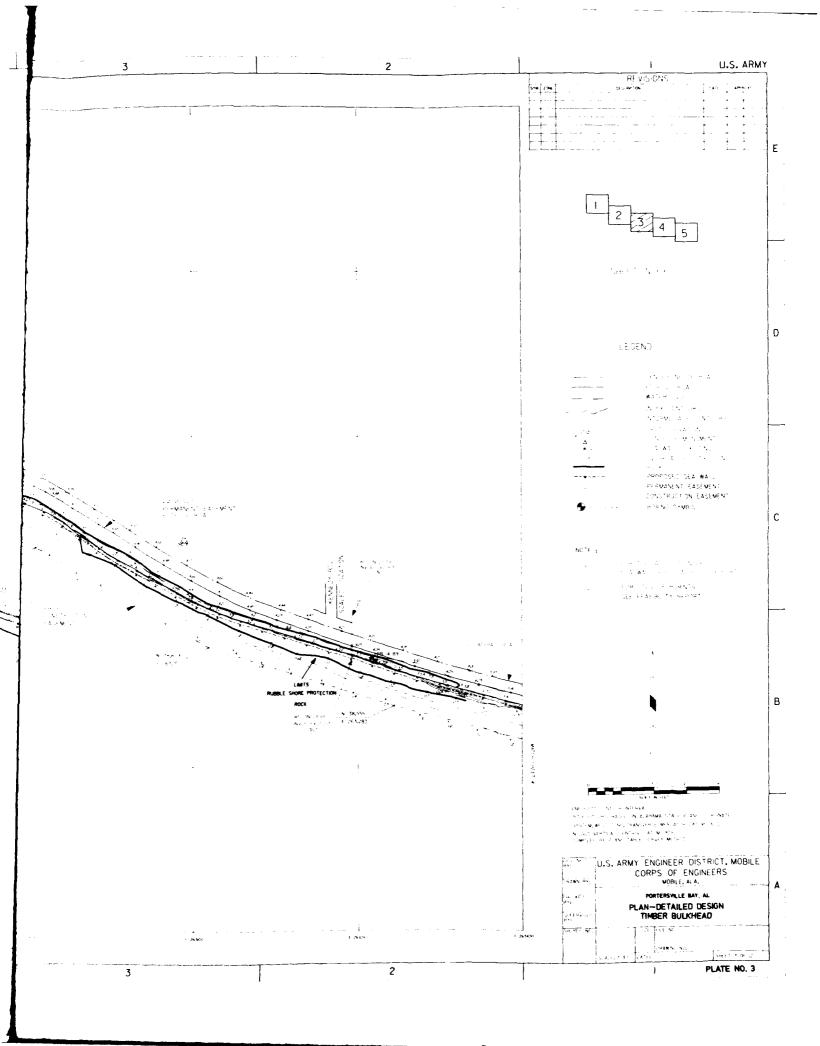


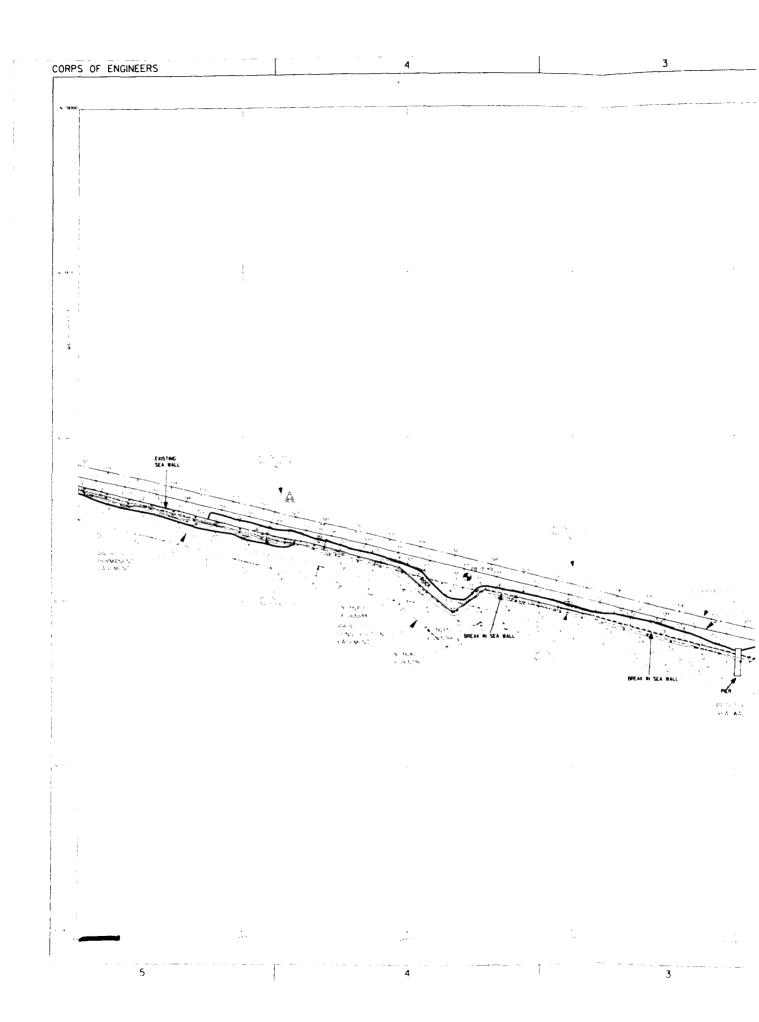


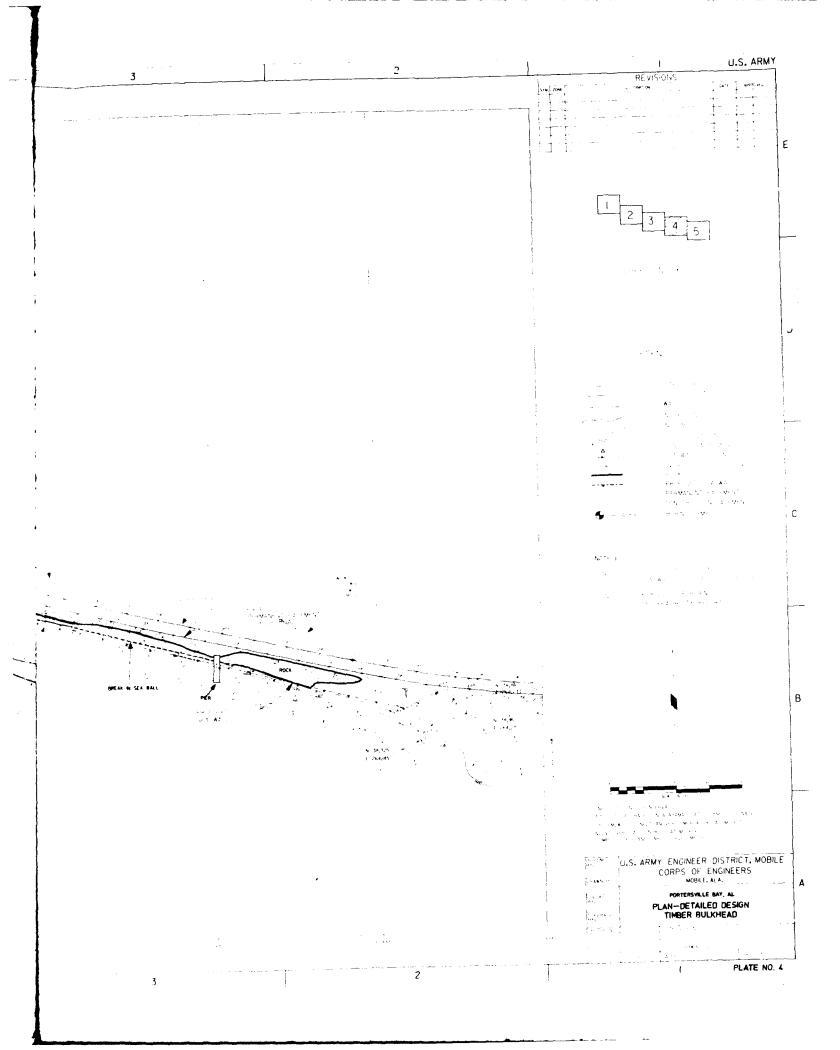




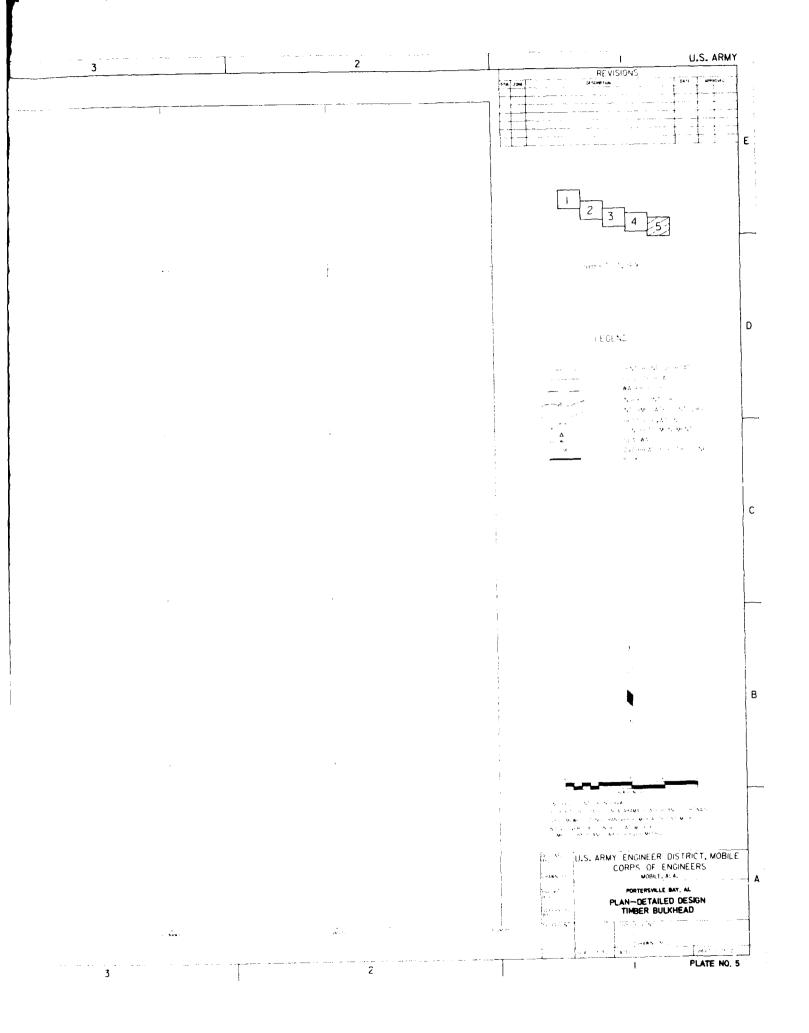


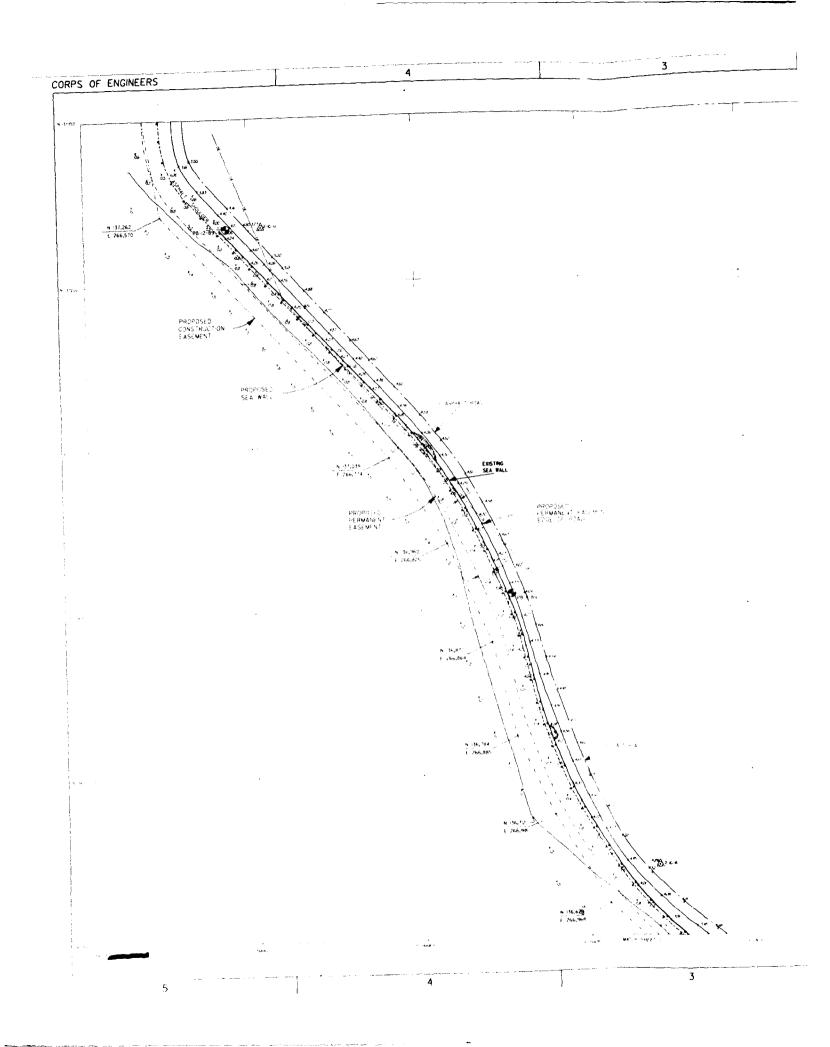


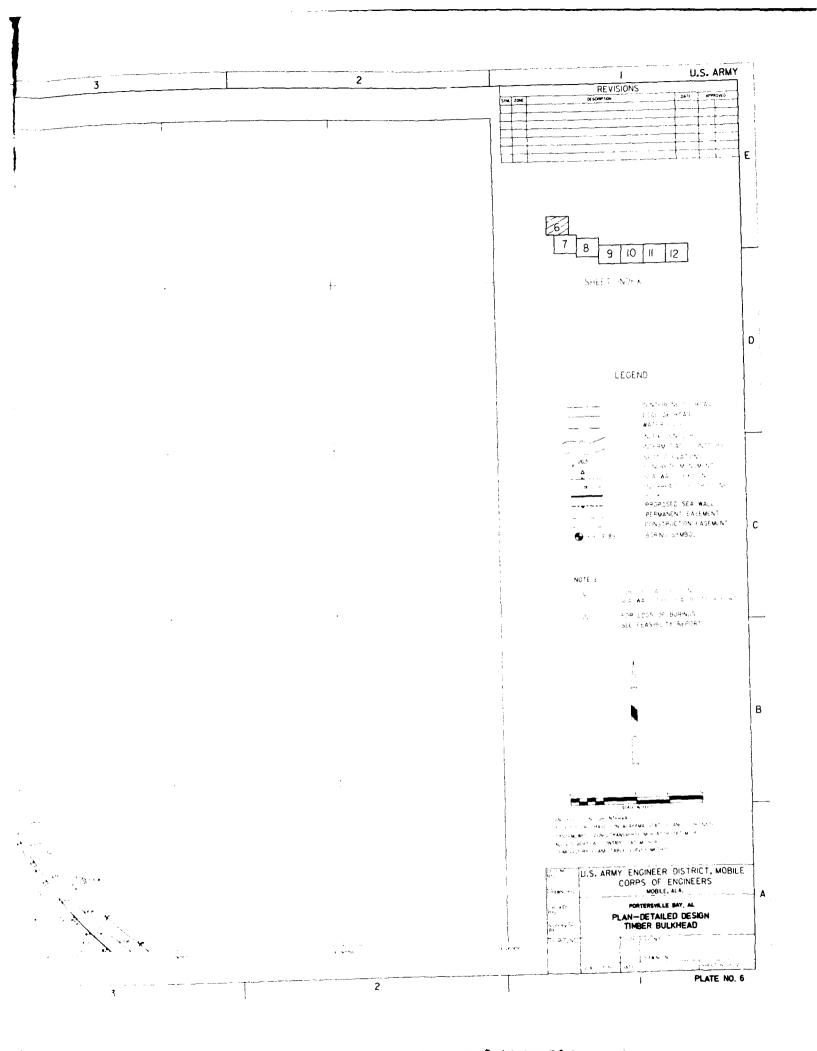


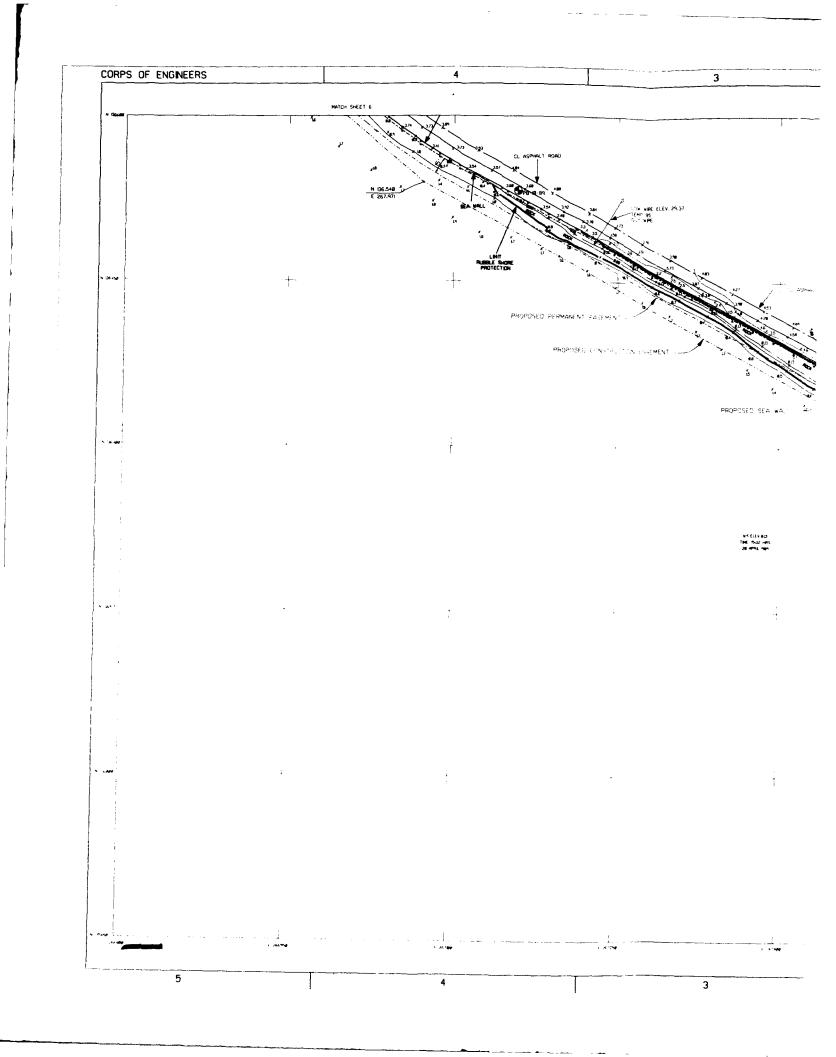


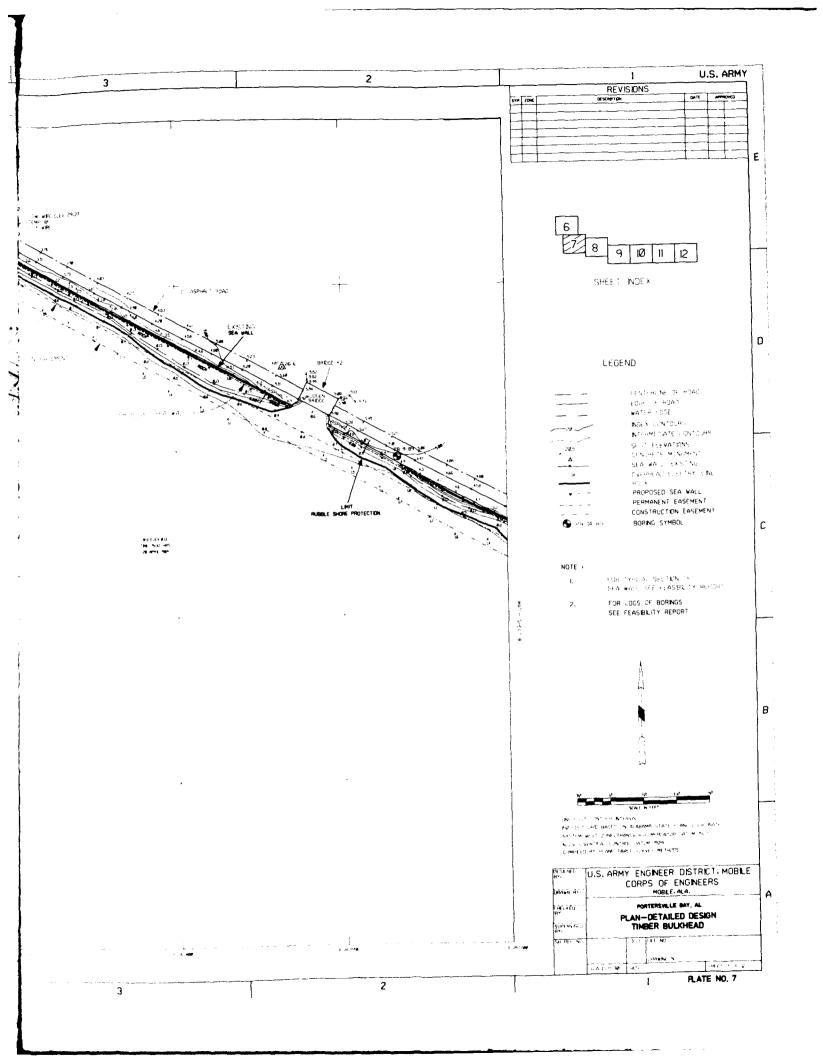
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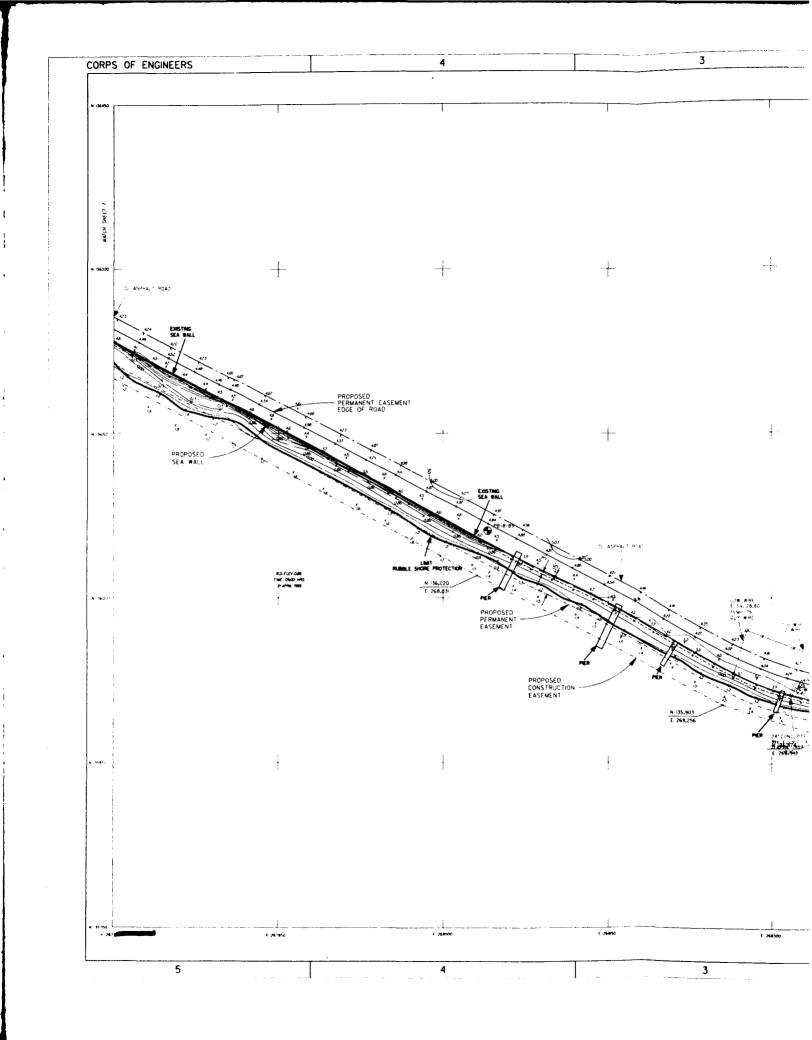


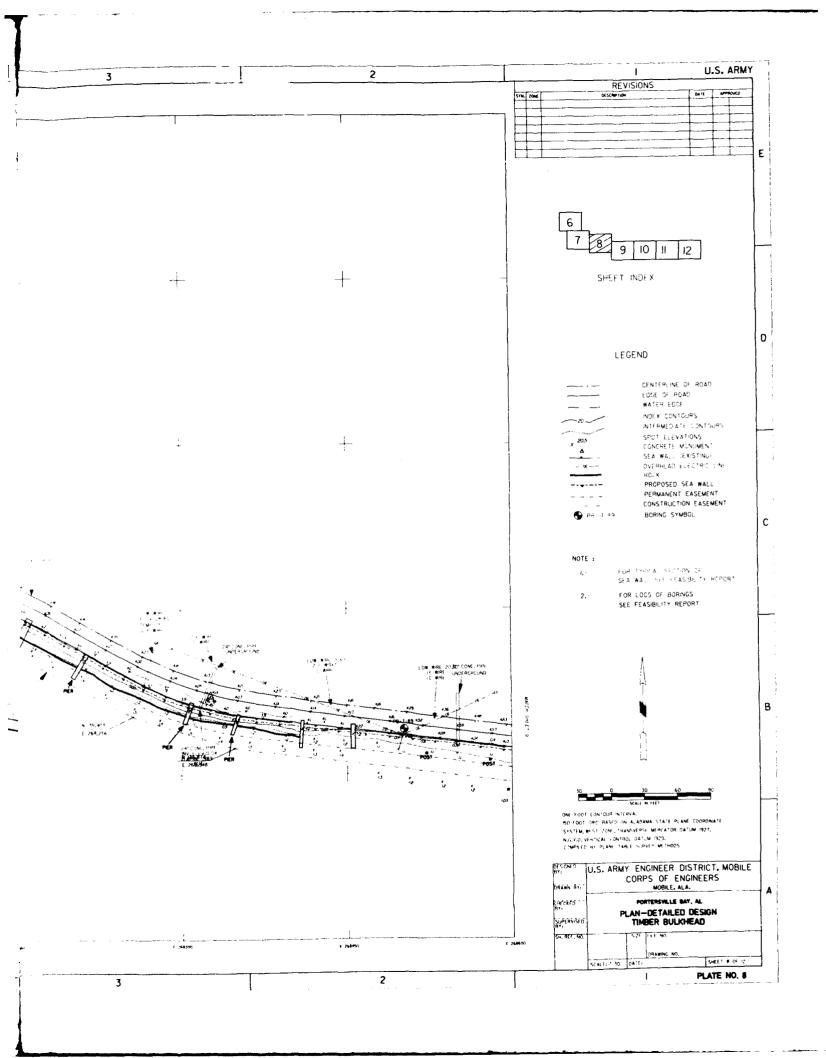


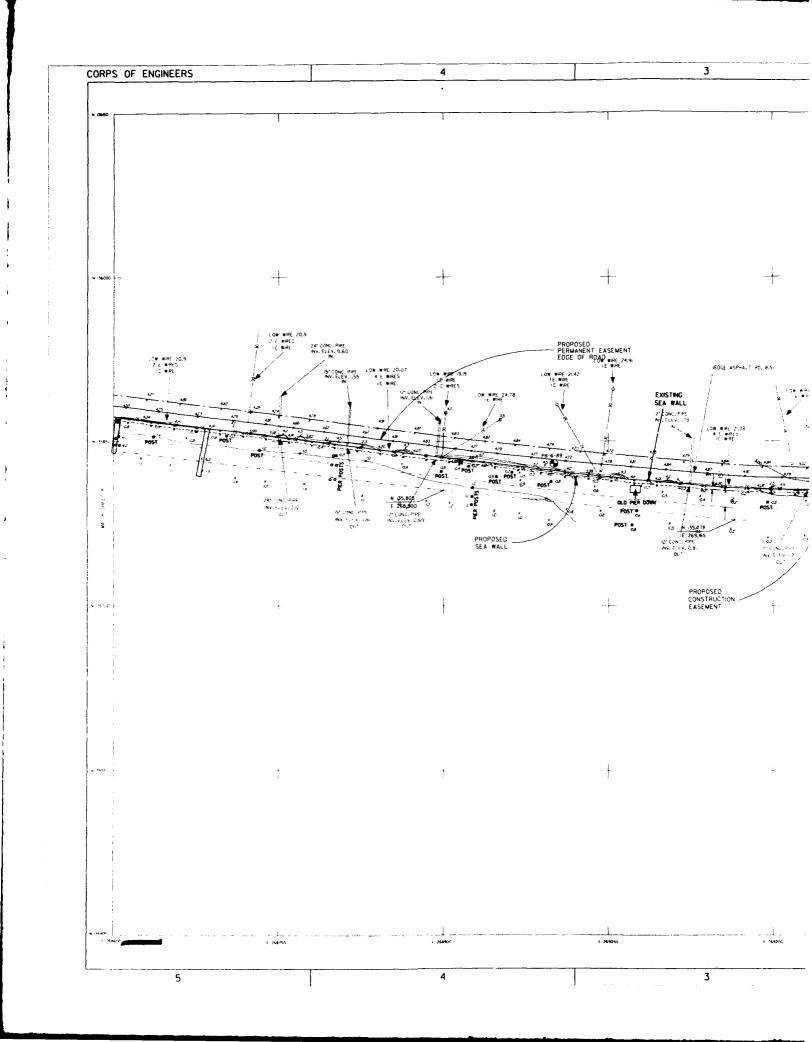


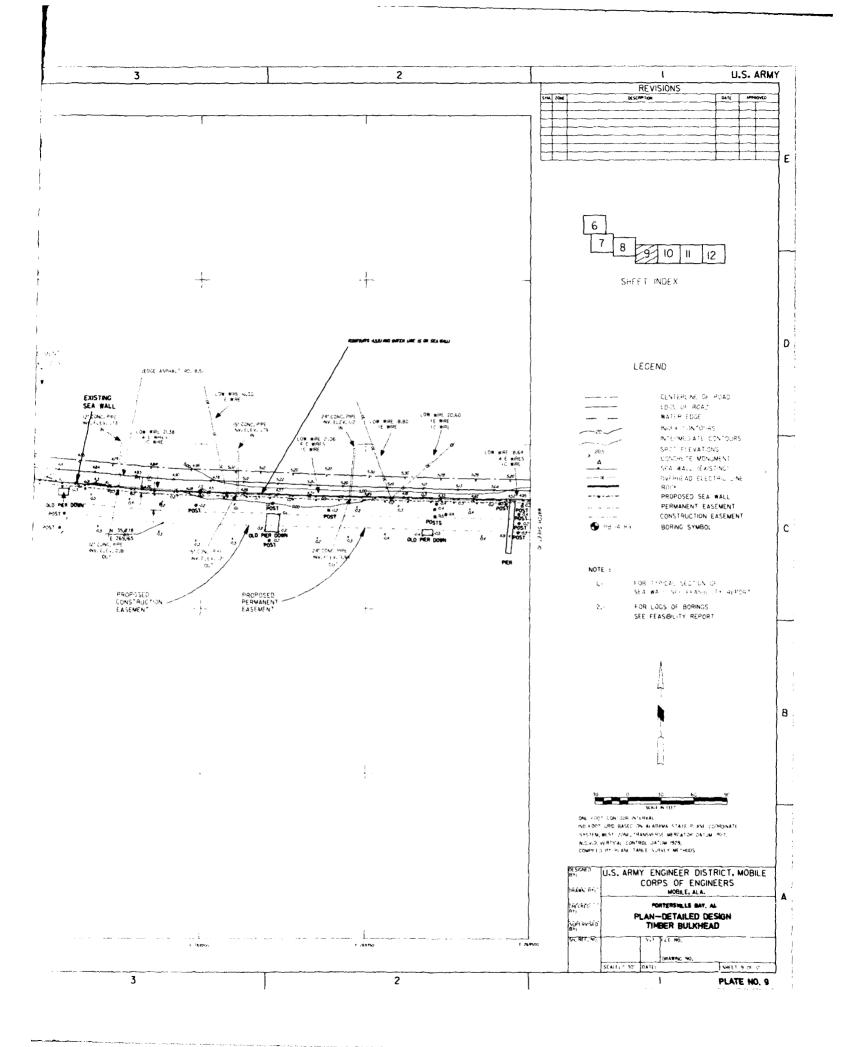


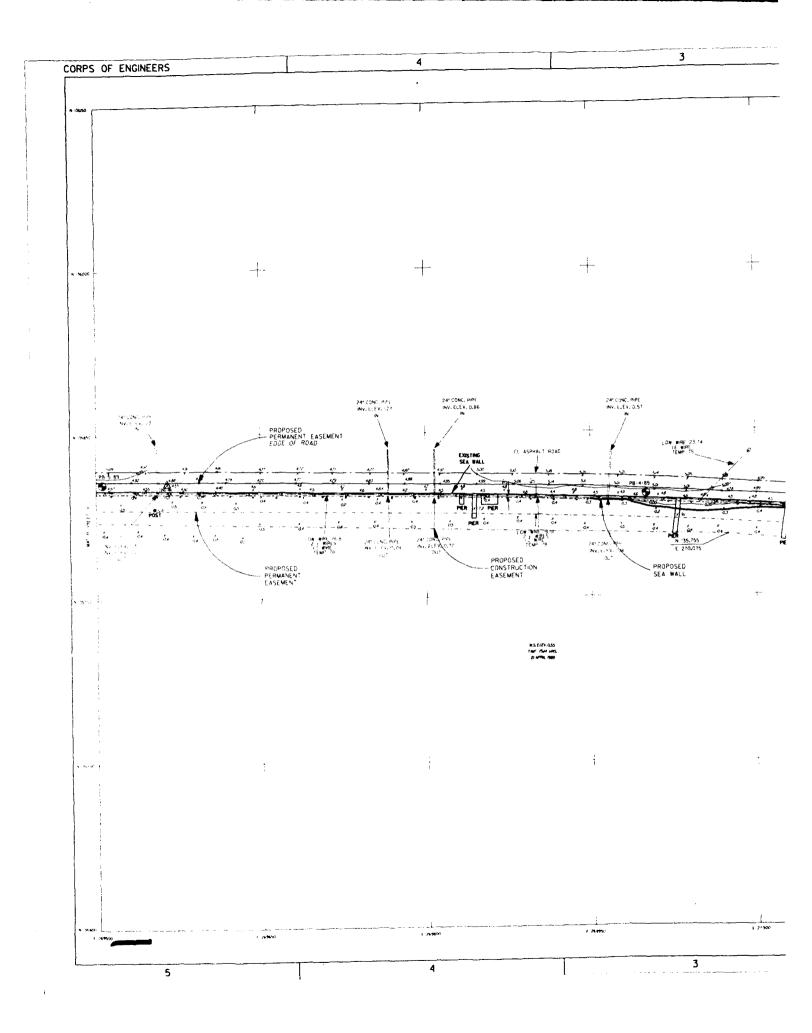


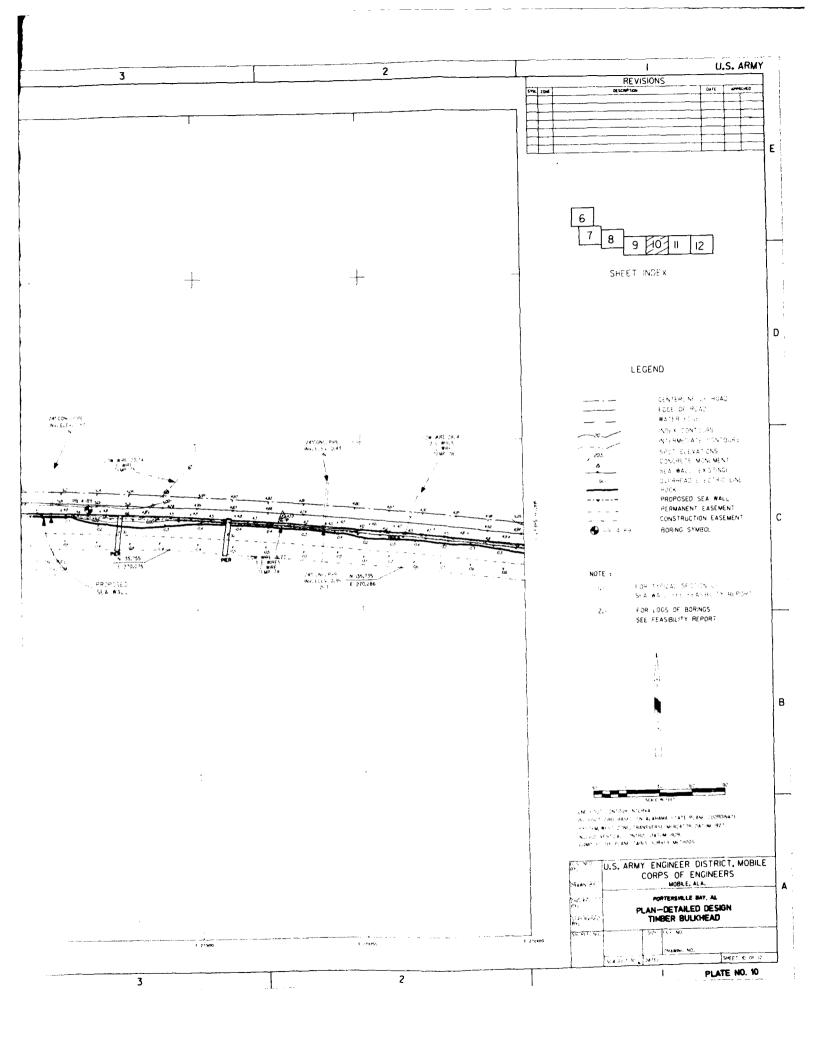


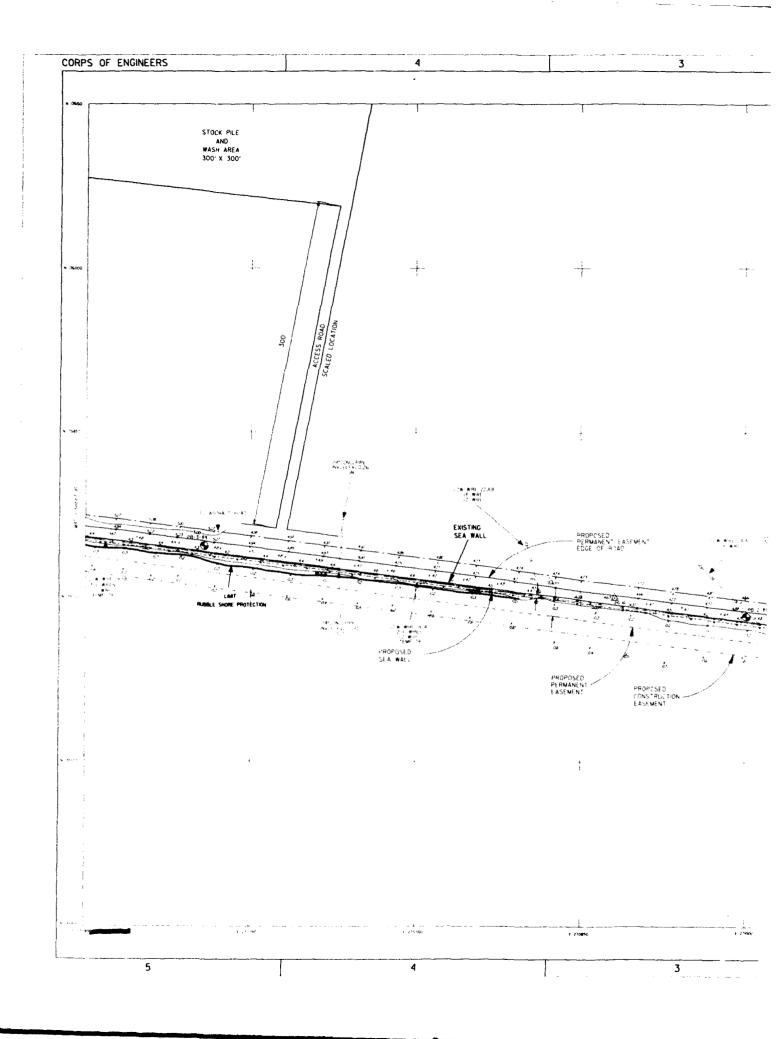


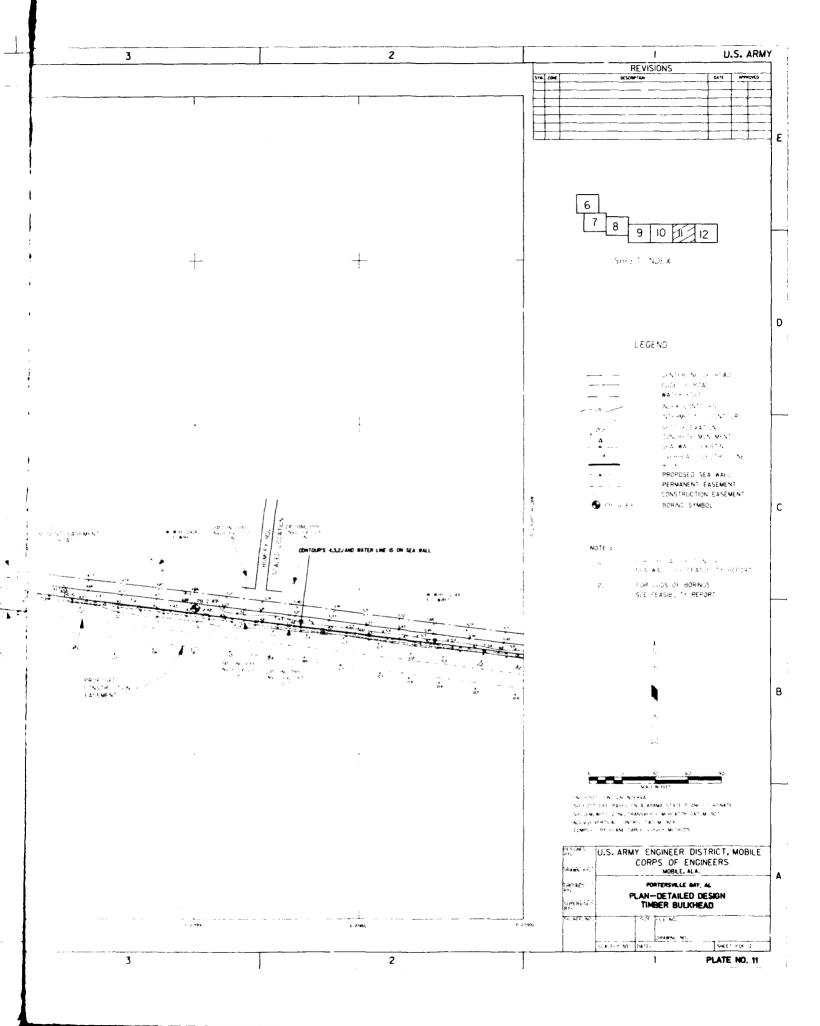




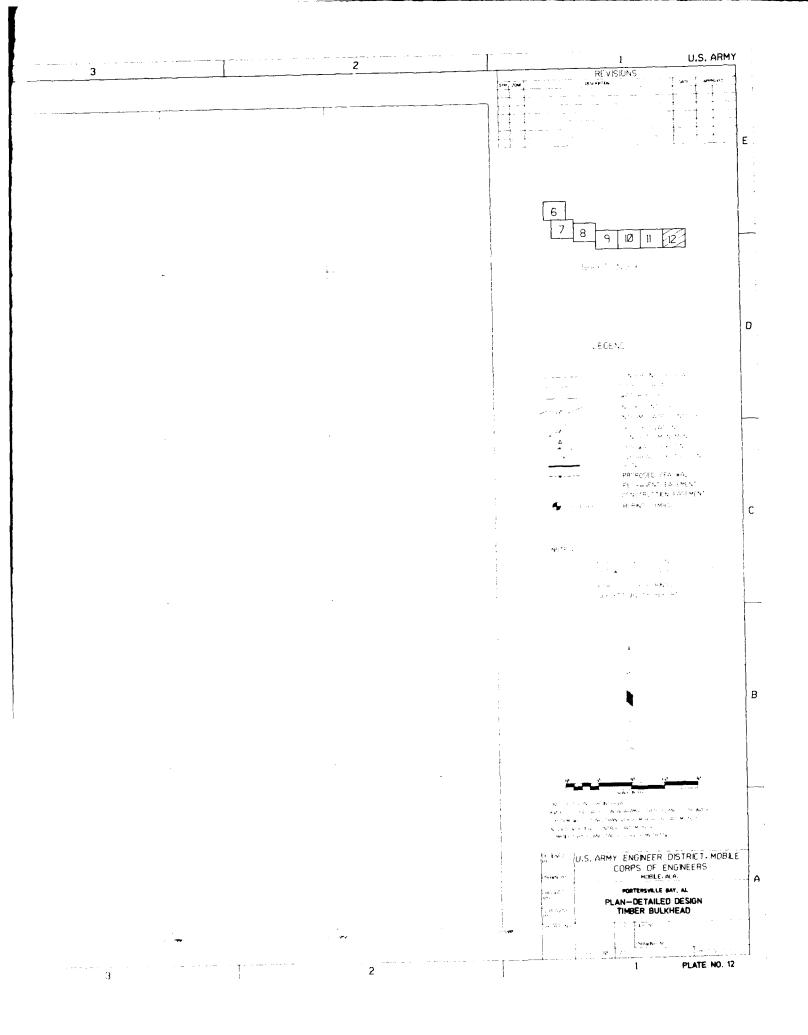








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ENVIRONMENTAL DOCUMENTATION

ENVIRONMENTAL ASSESSMENT FOR SHORELINE PROTECTION ALONG PORTERSVILLE BAY MOBILE COUNTY, ALABAMA

1. PROJECT DESCRIPTION. Portersville Bay is located in the vicinity of Bayou Coden, in south Mobile County, Alabama, about 24 miles southwest of Mobile. The Bay, an arm of the Mississippi Sound, is about 7.6 miles northwest of Cedar Point, the southern tip of the western mainland shore of Mobile Bay. The tributary area embraces southern Mobile County and the coastal waters and communities along Alabama's southwest coast.

The Shell Belt and Coden Belt roads are located on the shore of Portersville Bay and run parallel to the shoreline (See Figure 1). Each road was protected from the bay wave action by a timber seawall which varies from four to twelve feet from the shoulder of each road. However, severe deterioration of the seawalls have resulted in erosion along both roads. A large portion of the seawalls were constructed in the 1930's.

- 2. DESCRIPTION OF THE PROPOSED ACTION. The proposed action involves the construction of a timber bulkhead approximately 3 feet waterward of the existing bulkhead. The bulkhead would provide protection for approximately 3,500 feet of shore along Shell Belt Road and approximately 5,600 feet along Coden Belt Road. The bulkhead would consist of 1 by 8 inch treated timber sheeting, 3 by 8 inch treated timber wales, and 10-inch diameter 12-foot vertical piles (See Figure 2). The sheeting is backed by a non-woven filter fabric. The embankment behind the bulkhead would be filled with approximately 4,400 cubic yards (cy) of compacted pervious material. The piles will have a penetration depth of approximately eight to ten feet and are spaced four feet center to center. The wales span from pile to pile with attached vertical sheeting. The sheeting will penetrate the bottom approximately three feet belo the dredge line to prevent wave action from scouring the toe and undermining the seawall sheeting. Approximately 2,100 cy of rubble from the existing bulkhead consisting of broken concrete, brick, etc., would be relocated to the bay side of the new bulkheads to prevent toe scour and to dissipate small wave action energy.
- 3. NEED FOR THE PROPOSED ACTION. The majority of the seawalls along both Coden Belt Road and Coden Shore Road were constructed in the 1930's, and due to age, are beginning to deteriorate and fail. In some areas, erosion is beginning to undermine the road. Fill material is continuously being placed behind the seawalls but this material continues to erode into the bay due to the deterioration of the structures. If the seawalls are not repaired, the adjacent roadway could fail.
- 4. ENVIRONMENTAL IMPACTS OF PROPOSED ACTION. The principle environmental impacts of the proposed action include the loss of water bottoms and its associated littoral fauna, and some existing shoreline where the old seawalls do not extend. Approximately 0.60 acres of water bottoms and an undetermined amount of shoreline intertidal habitat would be lost to the placement of the timber bulkheads, stone, and fill. However, the placement of stones and timber piles in the shallow water zone would add diversity to the ecosystem by

CESAM-PD-EC Morgan

Date Prepared: 23 April 1990

providing new substrate for littoral flora and fauna. This hard substrate would provide good quality attachment, shelter, and foraging habitat for aquatic biota.

Construction impacts would include a slight temporary degradation of existing water quality due to increased turbidity resulting from placement of the timber and fill. Construction would be conducted with land based equipment, therefore, increases in turbidity would be minimal. An extensive system of submerged aquatic grassbeds are located approximately 14 to 20 meters offshore of the existing wall. The grassbeds are extremely valuable to fishery resources such as blue crab, shrimp, flounder, speckled sea trout, etc. The proposed action would have minimal impacts to the nearby grassbeds. The mode of operation (land based equipment) and the inert nature of the fill material would reduce impacts to the grassbeds. In addition, the proposed work would be scheduled to the extent possible during the winter months (November to March) when the grassbeds are dormant and generally dewatered.

The proposed project would not significantly affect existing air quality or noise levels in the area. Some minor aesthetic value decreases could occur. Some physical presence of the construction equipment would affect visual qualities of the area. However, this impact would be temporary and would cease immediately after the construction activity is completed.

- 5. ALTERNATIVES TO THE PROPOSED ACTION. Alternatives to the proposed action which were considered include:
- a. No action. In the no action alternative, no structural modification responsive to the problems and needs of the local interest would be accomplished by a Federal action. As a result, the seawall could continue to deteriorate and could eventually result in a loss of portions of Shell Belt and Coden Belt roads, adjacent utilities, public land, and private property unless non-federal entities take some preventive measures.
- b. Riprap revetment. The riprap revetment would involve placing appropriately graded stone on 6-inch bedding material and filter fabric. The elevation of the top of the riprap revetment would be approximately 3.0 feet and would extend approximately 18-feet into Portersville Bay from the existing seawall. The area behind the riprap revetment would require filling and seeding.
- c. <u>Gabion revetment</u>. This alternative for the replacement of the existing timber bulkhead would utilize the use of gabions. The proposed gabion revetment would consist of gabion baskets founded on a 1 foot by 12 foot gabion mat and bedding material overlying filter fabric. Drainage behind the wall would be provided by free draining porous fill material. The overall height of the wall from bedding to top of the wall would not exceed 7 feet 6 inches.
- 6. ENDANGERED AND THREATENED SPECIES. Coordination with the National Marine Fisheries Service (5 December 1989) to identify species on the U.S. Department

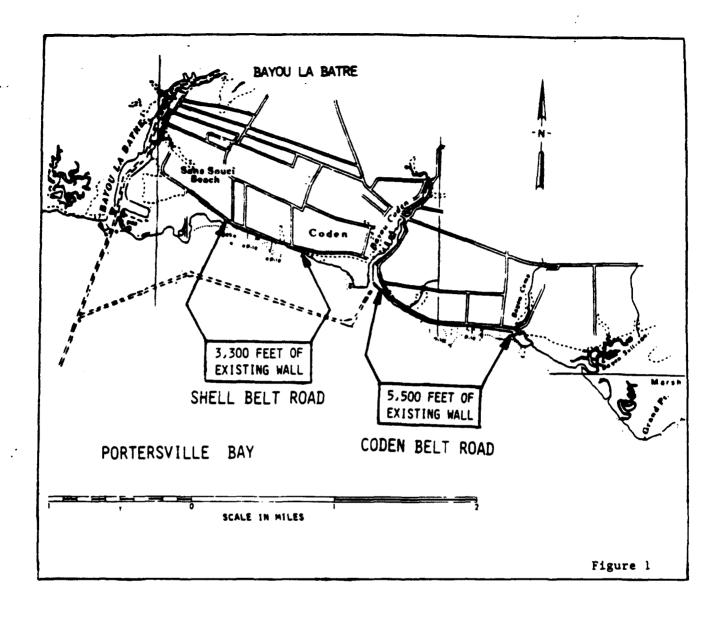
of Interior List of Endangered and Threatened Wildlife and Plants indicated there would be no adverse effect on any listed endangered, threatened, or proposed species or their critical habitat. By letter dated 27 November 1989, the U.S. Fish and Wildlife Service indicated no endangered, threatened, or proposed species or their critical habitat occur within the project areas.

- 7. CLEAN WATER ACT CONSIDERATIONS. A Section 404(b)(1) Evaluation for the discharge of fill material into waters of the U.S is appended. By letter dated, 22 March 1990, Alabama Department of Environmental Management (ADEM) issued water quality certification for the proposed action.
- 8. COASTAL ZONE MANAGEMENT ACT CONSIDERATIONS. Review of the State of Alabama Coastal Zone Management Plan indicates that the proposed construction is consistent with the plan to the maximum extent practicable. ADEM concurred with the consistency determination on 22 March 1990.
- 9. <u>CULTURAL RESOURCES</u>. There are several recorded prehistoric shell middens in the vicinity of Bayou Coden. None of these would be affected by the proposed construction activities since the work area would be confined to the existing paved road adjacent to and within Portersville Bay. By letter dated, 27 November 1989, the Alabama State Historic Preservation Officer (SHPO) was asked to concur with the Mobile District's archaeologist findings that no cultural resources would be impacted as a result of the action. The SHPO concurred with the letter on 18 December 1989.
- 10. LIST OF AGENCIES, INTERESTED GROUPS AND PUBLIC CONSULTED.

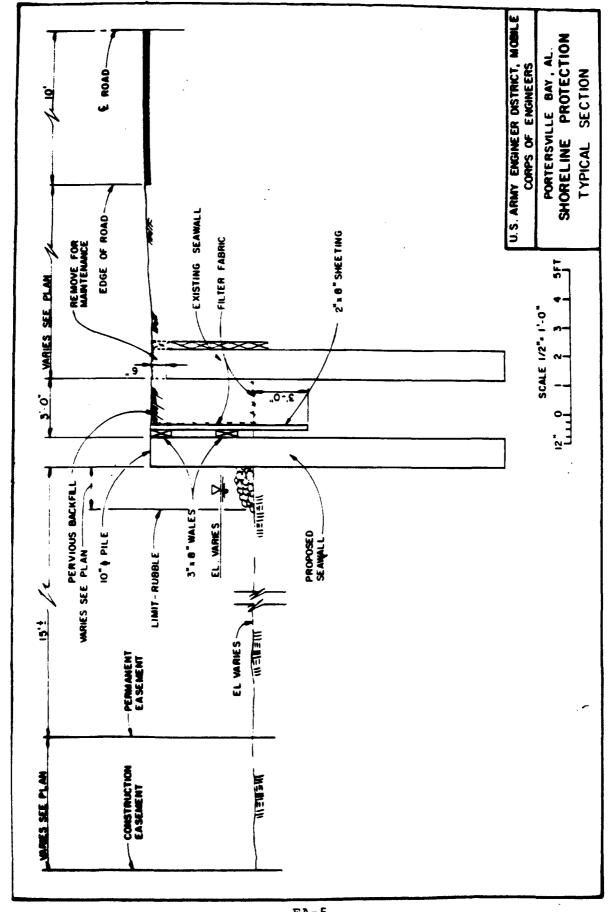
Alabama Department of Environmental Management

Alabama State Historic Preservation Officer

- U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
 - U.S. Department of Interior, Fish and Wildlife Service



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SECTION 404(b)(1) EVALUATION REPORT FOR SHORELINE PROTECTION ALONG PORTERSVILLE BAY MOBILE COUNTY, ALABAMA

1. DESCRIPTION OF AUTHORIZED FEDERAL PROJECT.

- a. Location. Portersville Bay is located in the vicinity of Bayou Coden, in south Mobile County, Alabama, about 24 miles southwest of Mobile (See Figure 1). The Bay, an arm of the Mississippi Sound, is about 7.6 miles northwest of Cedar Point, the southern tip of the western mainland shore of Mobile Bay. The tributary area embraces southern Mobile County and the coastal waters and communities along Alabama's southwest coast.
- b. Description of the Proposed Action. The proposed action involves the construction of a timber bulkhead approximately 3 feet waterward of the existing bulkhead. The bulkhead would provide protection for approximately 3,500 feet of shore along Shell Belt Road and approximately 5,600 feet along Coden Belt Road. The bulkhead would consist of 1 by 8 inch treated timber sheeting, 3 by 8 inch treated timber wales, and 10-inch diameter 12-foot vertical piles (See Figure 2). The sheeting is backed by a non-woven filter fabric. The embankment behind the bulkhead would be filled with approximately 4,400 cubic yards (cy) of compacted pervious material. The piles will have a penetration depth of approximately eight to ten feet and are spaced four feet center to center. The wales span from pile to pile with attached vertical sheeting. The sheeting will penetrate the water bottom approximately three feet below the dredge line to prevent wave action from scouring the toe and undermining the seawall sheeting. Approximately 2,100 cy of rubble from the existing bulkhead consisting of broken concrete, brick, etc., would be relocated to the bay side of the new bulkheads to prevent toe scour and to dissipate small wave action energy.
- c. Authority and Purpose. This report was prepared under the authority of Section 14 of the Flood Control Act of 1946, as amended. The purpose of this study and report was to investigate the deterioration of existing seawalls along Coden Belt Road and Shell Belt Road.
 - d. General Description of Dredged or Fill Material.
- (1) General Characteristics of Material. Pervious material would be placed behind the bulkhead and existing rubble would be placed in front of the bulkheads to prevent toe scour.
- (2) Quantity of Material. Approximately 4,400 cy of compacted previous material would be used as fill behind the bulkhead. Approximately 2,100 cy of rubble would be placed in the bay at the toe of the bulkhead.
- (3) Source of Material. The fill material would be obtained from commercial sources and from the existing bulkhead.
 - e. General Description of Discharge Sites.
 - (1) Location. The discharge sites are located approximately 3,500

feet along Shell Belt Road and approximately 5,600 feet along Coden Belt Road (See Figure 1).

- (2) Size (Acres). Approximately 0.70 acres of water bottoms will be filled with fill material.
- (3) Type of Site. The discharge sites for the construction of the timber bulkheads are primarily in the open water within the littoral zone and adjacent banks of Portersville Bay.
- (4) Types of Habitats. Approximately 0.70 acres of aquatic habitat would be covered with fill material.
- (5) <u>Timing and Duration of Discharge</u>. The proposed construction will be scheduled to the extent possible, during the winter months and last approximately 6 months.
- (6) <u>Description of Discharge Methods</u>. The fill would be trucked to the sites and placed by dragline from the road.

2. FACTUAL DETERMINATIONS.

a. Physical Substrate Determinations.

- (1) <u>Substrate elevation and slope</u>. The substrate elevations along Shell Belt Road range from -0.9 to 4.1 feet NGVD. The elevations along Coden Belt Road range from -1.3 to 4.9 feet NGVD.
 - (2) Sediment type. Refer to Paragraph 1.b.(1) of this evaluation.
- (3) $\underline{\text{Dredged/fill material movement}}$. Due to the nature of the fill material and containment, movement would be insignificant.
- (4) Physical effects on benthos. Placement of the fill material and rubble would cover non-motile organisms living within the alignment of the proposed protective structure.
 - (5) Other effects. No other substrate effects are expected.
- (6) Actions taken to minimize impacts. Placement of fill material would be within a defined area, thereby, minimizing impacts to benthos.
- b. Water Circulation/Fluctuation, and Salinity Determination.

(1) Water.

(a) Salinity. No significant impacts.

- (b) Water Chemistry. No significant impacts.
- (c) Clarity. Water clarity may be temporarily reduced due to fill activities but should return to normal shortly after construction is completed.
 - (d) Color. No significant impacts.
 - (e) Odor. No significant impacts.
 - (f) Taste. No significant impacts.
 - (g) Dissolved Gases. No significant impacts.
 - (h) Nutrients. No significant impacts.
 - (i) Eutrophication. No significant impacts.
 - (2) Current Patterns and Circulation.
 - (a) Current patterns and flow. No significant impacts.
 - (b) Velocity. No impacts.
 - (c) Stratification. No impacts.
 - (d) Hydrologic effect. No impacts.
 - (3) Normal Water Level Fluctuations. No significant impacts.
 - (4) Salinity Gradients. No impacts.
- (5) Actions That Will be Taken to Minimize Impacts. Since water circulation, fluctuation, and salinity gradients would not be affected significantly, no actions to minimize impacts would be required.
 - c. Suspended Particulate/Turbidity Determinations.
- (1) Expected changes in suspended particulate and turbidity levels in the vicinity of the disposal site. Temporary and localized increases in turbidity levels are expected during construction activities. However, once construction is completed conditions would return to normal.
- (2) Effects on the chemical and physical properties of the water column.

- (a) Light penetration. No significant effects.
- (b) <u>Dissolved Oxygen</u>. Slight decreases in dissolved oxygen concentrations would occur during construction activities.
 - (c) Toxic metals and organics. No significant effects.
 - (d) Pathogens. No significant effects.
 - (e) Aesthetics. No significant effects.
 - (f) Others as appropriate. Not applicable.
 - (3) Effects on biota.
 - (a) Primary production, photosynthesis. No significant impacts.
 - (b) Suspension/filter feeders. No significant impacts.
 - (c) Sight feeders. No significant impacts.
- (4) Actions taken to minimize impacts. No actions to minimize impacts would be required because the impacts are not significant.
- d. Contaminant Determination. The materials to be used were not tested because the sand and stone have been determined to meet the exclusion criteria under 40 CFR 230.60. The materials are characterized as inert sand and stone which are sufficiently removed from sources of pollution to provide reasonable assurance that they would not be contaminated by such pollution. The porous fill material would be obtained from a commercial source which is free of contaminants.
 - e. Aquatic Ecosystem and Organism Determinations.
 - (1) Effects on plankton. No significant effects.
- (2) <u>Effects on benthos</u>. Non-motile benthic organisms living on or within the approximately 0.70 acres to be filled would be destroyed.
 - (3) Effects on nekton. No significant effects.
 - (4) Effects on aquatic food web. No significant effects.
 - (5) Effects on special aquatic sites.
 - (a) Sanctuaries and refuges. No significant effects.
 - (b) Wetlands. Marshes are located to the east and west of the

existing bulkhead along Shell Belt Road and to the east of the bulkhead along Coden Belt Road. The replacement bulkheads would tie into land on each end to avoid these marshes.

- (c) Mud flats. No effects.
- (d) <u>Vegetated shallows</u>. There are submerged grassbeds located approximately 14-20 meters offshore from the existing bulkheads. The construction would be conducted from land to keep turbidity at a minimum. Also, the nature of the fill material, sand and rubble, would also minimize impacts to this resource.
 - (e) Coral reefs. No effects.
 - (f) Riffle and pool complexes. No effects.
- (6) Threatened and endangered species. Coordination with the U.S. Fish and Wildlife and the National Marine Fisheries Service indicated that no endangered, threatened, or proposed species or their critical habitat occur within the projects areas.
 - (7) Other wildlife. No significant effects.
- (8) Actions to minimize impact. Construction would be conducted from land and to the extent possible in the winter months when the grassbeds are dormant and generally dewatered.
 - f. Proposed Disposal Site Determinations.
 - (1) Mixing zone determinations. Not applicable.
- (2) <u>Determination of compliance with applicable water quality</u> <u>standards</u>. The proposed action would comply with applicable water quality standards. Water quality certification was received from Alabama Department of Environmental Management on 22 March 1990.
- (3) Potential effects on human use characteristics. The replacement of the bulkheads would result in the protection of both Coden Belt Road and Coden Shore Road.
 - (a) Municipal and private water supply. No impacts.
- (b) Recreational and commercial fisheries. No significant impacts.
 - (c) Water-related recreation. No impacts.
 - (d) Aesthetics. Only temporary degradation to the aesthetic

environment would occur as a result of the proposed action. Impacts would primarily occur as a result of the physical presence of construction equipment and possibly temporary localized increases in turbidity levels.

- (e) Parks, national and historic monuments, national seashores, wilderness areas, research sites, and similar preserves. No impacts.
- g. <u>Determination of Cumulative Effects on the Aquatic</u>
 <u>Ecosystem</u>. Cumulative effects would be negligible as the discharge will only occur once and involves relative small quantities of material.
- h. <u>Determination of Secondary Effects on the Aquatic</u>
 <u>Ecosystem</u>. No significant secondary impacts on the aquatic ecosystem are expected to occur as a result of the proposed action.

3. FINDING OF COMPLIANCE

- a. No significant adaptations to the guidelines were made relative to this evaluation.
- b. Several alternatives to the proposed method of accomplishing the action were considered. These alternatives were discussed in the Environmental Assessment to which this evaluation is appended and are given as follows
 - (1) No action.
 - (2) Riprap revetment.
 - (3) Gabion revetment.
- c. The proposed action would not violate any applicable State water quality standards.
- d. The proposed action would not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.
- e. The replacement of the bulkheads would not harm any endangered or threatened species or their critical habitat.
- f. The proposed activity would not result in any significant adverse effects on human health or welfare, including municipal or private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and other wildlife would not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values would not occur.

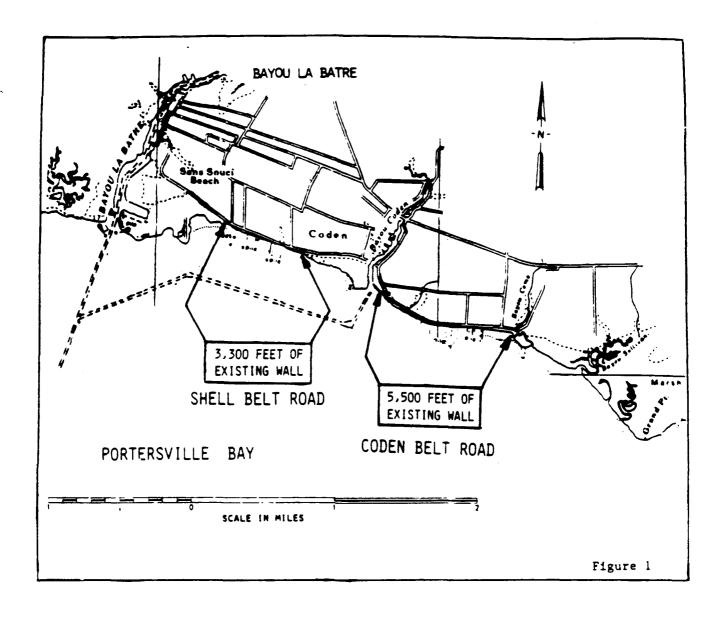
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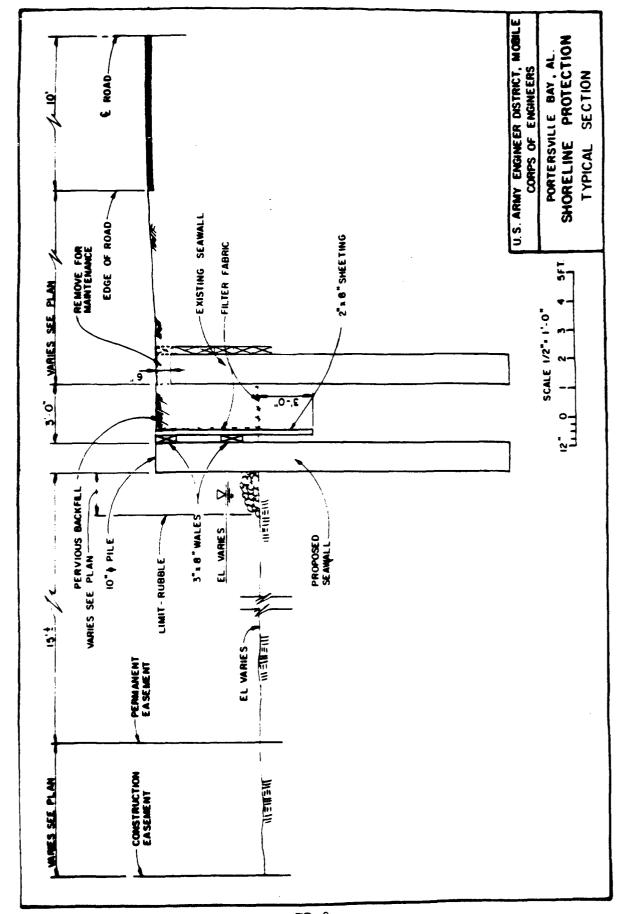
g. On the basis of the guidelines, the proposed sites for the discharge of fill materials are specified as complying with the requirement of these guidelines.

DATE 4 May 90

Larry S. Bonine MAJ TolColonel, Corps of Engineers

District Engineer





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FINDING OF NO SIGNIFICANT IMPACT (FONSI) FOR SHORELINE PROTECTION ALONG PORTERSVILLE BAY MOBILE COUNTY, ALABAMA

I. PROPOSED ACTION. The proposed action involves the construction of a timber bulkhead approximately 3 feet waterward of the existing bulkhead. The bulkhead would provide protection for approximately 3,500 feet of shore along Shell Belt Road and approximately 5,600 feet along Coden Belt Road. The bulkhead would consist of 1 by 8 inch treated timber sheeting, 3 by 8 inch treated timber wales, and 10-inch diameter 12-foot vertical piles. The sheeting is backed by a non-woven filter fabric. The embankment behind the bulkhead would be filled with approximately 4,400 cubic yards (cy) of porous material. The piles will have a penetration depth of approximately eight to ten feet and are spaced four feet center to cen:er. The wales span from pile to pile with attached vertical sheeting. The sheeting will penetrate the water bottom approximately three feet below the dredge line to prevent wave action from scouring the toe and undermining the seawall sheeting. Approximately 2,100 cy of rubble from the existing bulkhead consisting of broken concrete, brick, etc., would be relocated to the bay side of the new bulkheads to prevent toe scour and to dissipate small wave action energy.

II. ALTERNATIVES CONSIDERED.

- a. No action.
- b. Riprap revetment.
- c. Gabion revetment.

III. FACTORS CONSIDERED IN THE DETERMINATION THAT NO SUPPLEMENT TO THE EXISTING ENVIRONMENTAL IMPACT STATEMENT IS REQUIRED.

Based on the results of the Environmental Assessment and 404(b)(1) Evaluation Report, the environmental impacts associated with the proposed action are minor and short-term. Specific factors considered in making this determination include:

- a. No endangered or threatened species or their critical habitat would be affected by the proposed work.
- b. No cultural resources would be affected by the proposed construction since the work area would be confined to the existing paved road adjacent to Portersville Bay and within the bay.
- c. Feasible alternatives to the proposed actions have been considered and none that are practicable have less adverse impacts on the environment.
 - d. Turbidity generated by the filling operations would be short-term

and minor in nature.

e. The discharge would be accomplished under conditions which would minimize, to the maximum extent practicable, adverse environmental effects to the aquatic and semi-aquatic ecosystem.

IV. <u>CONCLUSIONS</u>. An evaluation of the attached environmental assessment indicates the proposed action would have no significant impact and a supplement to the existing Final Environmental Impact Statement for this action is not required. By letter dated, 22 March 1990, water quality certification and coastal zone consistency were issued by the Alabama Department of Environmental Management.

Date 4 May 90

LARRY S. BONINE

Colonel, Corps of Engineers

District Engineer

STATEMENT OF FINDINGS

Proposed Timber Bulkhead Shore Protection PORTERSVILLE BAY Mobile County, Alabama A Federally Authorized Project

As District Engineer, Mobile District Corps of Engineers, it is my duty in the role of responsible Federal Officer to review and evaluate, with regard to the views of other agencies and the concerned public, the environmental effects of this activity. My evaluation and findings are as follows:

1. DESCRIPTION OF THE PROPOSED ACTION.

The proposed action involves the construction of new timber bulkheads along two segments of Portersville Bay shoreline between Bayou la Batre and Bayou Como. Mobile County., to replace existing timber bulkheads that are deteriorating due to age. The new bulkheads will provide protection from severe erosion that is threatening existing paved roadways paralleling the shoreline.

2. RESULTS OF COORDINATION.

- a. The proposed action was circulated on a 15 day Corps of Engineers/ADEM joint public notice, Public Notice No. FP89-BCO3-2, which was issued on 1 December 1989 (Enclosure 1).
- b. The Alabama State Historic Preservation Officer countersigned and returned our letter of November 27, 1989 agreeing that the proposed project would have no adverse effects on cultural resources. (Enclosure 2)
- c. By letter of November 29, 1989, the Mobile District requested the Mobile County Commission to pay a fee of \$500.00 to the State of Alabama for Water Quality Certification (Enclosure 3). The fee amount was subsequently corrected to \$100.00 by telephone.
- d. By letter of December 7, 1989, the Fish and Wildlife Service indicated they had no objections to the project (Enclosure 4).
- e. On December 12, 1989, the Mobile District requested the Alabama Department of Environmental Management to issue State Water Quality Certification and Coastal Zone Consistency for the project (Enclosure 5).
- f. On December 30, 1989, a legal notice was published in the Mobile Press Register (Enclosure 6).
- g. By letter of March 22, 1990 the Alabama Department of Environmental Management issued State Water Quality Certification and Coastal Zone Management Certification (Enclosure 7).

- h. On March 29, 1990, the National Marine Fisheries Service indicated they would not object to the project (Enclosure 8).
- i. By telephone conversation on March 28, 1990, the Environmental Protection Agency indicated they would have no comment on the project (Enclosure 9).

3. ENVIRONMENTAL EFFECTS AND IMPACTS.

- a. The environmental effects and impacts of the described action were and the referenced documents and were coordinated with environmental acencies and the public.
- b. The impacts associated with the proposed bulkhead construction project are addressed in an Environmental Assessment (EA) prepared for the proposed action. No comments were received in response to the public notice which made it necessary to revise the EA.
- b. A detailed evaluation of environmental concerns involved in the proposed project was prepared in accordance with Public Law 92-500, Section 404(b)(1) Guidelines, as promulgated by the U.S. Environmental Protection Agency. The impacts discussed in the referenced Section 404(b)(1) evaluation include temporary turbidity increases, covering of benthic communities, and temporary and insignificant reduction in phytoplankton productivity. No comments were received in response to the public notice which made it necessary to change the previously prepared 404(b)(1) Evaluation.
- c. The cumulative effects of this action upon the environment were considered and found to be insignificant.
- d. The proposed action is in compliance with applicable laws and regulations regarding the protection of water and air resources, cultural resources, and fish and wildlife resources.

Determination.

Based upon the above assessment, the Section 404(b)(1) Evaluation, and analysis of all comments received, I have made the following determinations:

- a. Feasible alternatives to the proposed discharge have been considered and none that are practicable will have less adverse impacts on the aquatic and semiaquatic ecosystem.
- b. There are no unacceptable environmental impacts on the aquatic and semiaquatic ecosystem.
- c. The placement of fill material will be accomplished under conditions which will minimize, to the extent practicable, adverse environmental effects on the aquatic and semiaquatic ecosystem.

5. Findings and Conclusions.

I, therefore, find that the discharge of fill materials into the waters of the United States, described herein, has been specified through the application of the Section 404(b)(1) Guidelines. After weighing all factors involved and considering the cumulative effects of the proposed action upon the environment, I have concluded that this project should proceed.

Date: 4 May 90

LARRY S. BONINE

District Engineer



DEPARTMENT OF THE ARMY

MOBILE DISTRICT, CORPS OF ENGINEERS P.O. BOX 2288 MOBILE, ALABAMA 36628-0001

REPLY TO ATTENTION OF:

CESAM-PD-EC
PUBLIC NOTICE NO. FP89-BC03-4

DECEMBER 1, 1989

JOINT PUBLIC NOTICE

U.S. ARMY CORPS OF ENGINEERS
AND
STATE OF ALABAMA
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

CONSTRUCTION OF WOOD BULKHEAD FOR SHORE PROTECTION IN THE VICINITY OF PORTERSVILLE BAY, MOBILE COUNTY, ALABAMA

Interested persons are hereby notified that the Corps of Engineers, Mobile District, proposes to perform shore protection work in the vicinity of Portersville Bay, Mobile County, Alabama, as authorized and directed by the United States Congress under Section 14 of the Flood Control Act of 1946, as amended.

This Public Notice is being issued in accordance with the rules and regulations published in the Federal Register on 26 April 1988. These regulations provide for the review of dredge and fill activities on Federally authorized projects under the following laws: The Federal Water Pollution Control Act; Clean Water Act; Marine Protection Research and Sanctuaries Act; Coastal Zone Management Act; National Environmental Policy Act; Fish and Wildlife Act; Migratory Marine Game-Fish Act; Fish and Wildlife Coordination Act; Endangered Species Act; and the National Historic Preservation Act. The review under these laws is applicable whenever dredged or fill materials may enter navigable waters. The recipient of this notice is requested specifically to review the proposed placement of fill as it may impact on water quality, relative to the requirements of Section 404(b)(1) of the Federal Water Pollution Control Act. Review of any other potential impacts is also requested.

WATERWAY AND LOCATION: The proposed project site is in two segments along the shoreline of Portersville Bay between Bayou la Batre and Bayou Como, Mobile County, Alabama. The first segment is about 3,700 feet long between Bayou la Batre and Bayou Coden. The second segment is about 5,600 feet long between Bayou Coden and Bayou Como. See Figure 1.

<u>PROPOSED ACTION</u>: The proposed action involves the construction of new timber bulkheads along the above two segments of shoreline to replace existing timber bulkheads that are deteriorating due to age. The new bulkheads will provide protection from severe erosion that is threatening existing paved roadways paralleling the shoreline.

The new bulkheads would be located three feet in front (bay side) of existing bulkheads which would remain in place. Approximately six inches of the existing bulkheads would be cut off below backfill grade. The new bulkheads would consist of 2"x 8" vertical sheeting, 3"x 8" wales, and 10" diameter piles. The sheeting would be backed by a non-woven filter fabric and backfilled with approximately 4,400 cubic yards of pervious soil. About 2,100 cubic yards of existing rubble consisting of broken concrete, brick, asphalt, etc., would be relocated from the vicinity of the existing bulkheads to the bay side of the new bulkheads to prevent toe scour and to dissipate energy from small wave action.

WATER QUALITY CERTIFICATION: Pursuant to the requirements of the Clean Water Act, State Water Quality Certification is required for the proposed action. Water quality certification is being requested from the Alabama Department of Environmental Management. Upon completion of the required comment period, a decision relative to certification will be made by the Department of Environmental Management.

CERTIFICATION OF CONSISTENCY: Pursuant to the requirements of the Coastal Zone Management Act, coastal area management program consistency has been requested from the State of Alabama. The proposed action is consistent with the program to the maximum extent practicable. Upon review of the action, a determination relative to the issuance of a consistency certification will be made by the Department of Environmental Management.

<u>USE BY OTHERS</u>: The proposed action is not expected to create significant impacts on land use plans. No prime farmland will be affected.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) CONSIDERATIONS: The impacts associated with the proposed bulkhead construction project are addressed in an Environmental Assessment (EA) prepared for the proposed action. Copies of the EA may be obtained from the Mobile District Office at the address given below. The EA will be finalized upon completion of coordination of the Public Notice.

SECTION 404(B)(1) EVALUATION REPORT: A preliminary evaluation of water quality impacts associated with the proposed action was prepared in accordance with guidelines promulgated by the Environmental Protection Agency (EPA) under Section 404(b)(1) of the Clean Water Act. The evaluation report is available upon

request from the Mobile District Office. Should input be received during the coordination of this notice that would dictate the need to revise the Section 404(b)(1) evaluation report, appropriate changes will be incorporated. Impacts discussed in the 404(b)(1) evaluation report include a temporary increase in turbidity and suspended solid concentrations.

<u>ENDANGERED SPECIES</u>: No listed endangered or threatened species should be affected by the proposed action. Coordination with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service has been initiated.

<u>CULTURAL RESOURCES CONSIDERATION</u>: There are several recorded prehistoric shell middens in the vicinity of Bayou Coden. None of these will be affected by the proposed construction activities since the work area will be confined to the existing paved road adjacent to Portersville Bay and to the immediate area within the bay. No properties listed on, determined to be eligible for, or being nominated to the National Register of Historic Places are located in the project vicinity. Concurrence in the proposed action by the Alabama State Historic Preservation Officer has been requested.

EVALUATION: The decision whether to proceed with the proposed action will be based on an evaluation of the probable impact including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, flood plain values, tand use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and, in general, the needs and welfare of the people. The proposed action will proceed unless it is found to be contrary to the overall public interest.

The Corps of Engineers is soliciting comments from the public; Federal, state, and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to proceed with the Federal activity. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine whether the proposed activity is contrary to the public interest.

COORDINATION: Among the agencies receiving copies of this public notice are:

Region IV, U.S. Environmental Protection Agency
Field Representative, U.S. Fish and Wildlife Service
Regional Director, National Park Service
Regional Director, National Marine Fisheries Service
Commander, Eighth Coast Guard District
Alabama Department of Conservation and Natural Resources
Alabama Department of Environmental Management
Gulf of Mexico Fishery Management Council
Federal Emergency Management Agency

Other Federal, State, and local organizations, U.S. Senators and Representatives of Alabama are being sent copies of the notice and are being asked to participate in coordinating this proposed work.

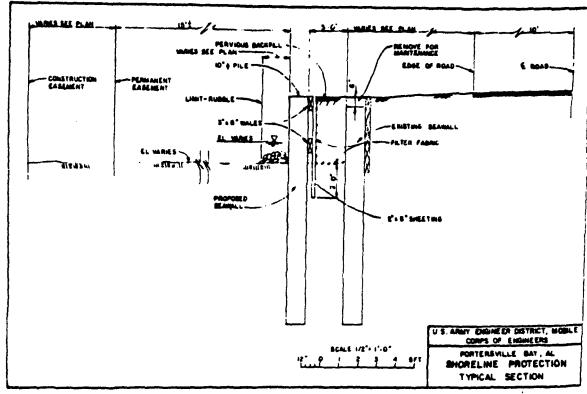
CORRESPONDENCE: Any person who has an interest which may be affected by the proposed activity may request a public hearing. Any comments or requests for a public hearing must be submitted in writing to the District Engineer within fifteen days of the date of this public notice. A request for a hearing must clearly set forth the interest which may be affected and the manner in which the interest may be affected.

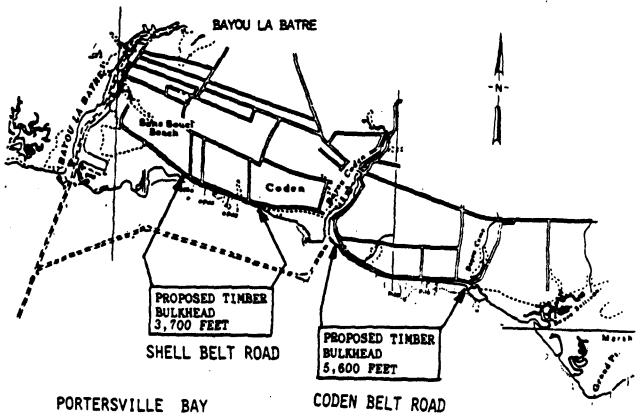
You are requested to communicate the information contained in this notice to any other parties who may have an interest in the proposed activities.

Correspondence concerning the public notice should refer to Public Notice No. FP89-BC03-4 and should be directed to the Commander, U.S. Army Engineer District Mobile, P.O. Box 2288, Mobile, Alabama 36628-0001, ATTN: CESAM-PD-EC, in time to be received prior to December 15, 1989. Mr. Bill Youngman, telephone number (205) 694-3881, may be contacted for additional information.

N. D. McCLURE IV U.S. Army Corps of Engineers

Mobile District





SCALE IN MILES

Figure 1



DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

November 27, 1989

RECEIVED

NOV 30 1989

Ala. Historical Commission

Environmental and Resources Planning Section

Mr. F. Lawerence Caks
Alabama State Historic
Preservation Officer
Alabama Historical Commission
725 Monroe Street
Montgomery, Alabama 36104

Dear Mr. Oaks:

REPLY TO

The Mobile District, U.S. Army Corps of Engineers, in cooperation with the Mobile County Board of Commissioners, is proposing to replace an existing sea wall for shoreline protection of the north shore of Portersville Bay between Bayou La Batre and Bayou Coden, Alabama. The project location is shown on the attached drawing.

Two alternate construction staging areas have been identified. Alternate one is located at the existing Alabams State Docks facilities at Bayou La Batre, alternate two is a community park west of Bayou Coden. The locations are indicated on the drawing.

There are several recorded prehistoric shell middens in the vicinity of Bayou Coden, (1Mb1, Mb8, and Mb91). None of these will be affected by the proposed construction activities since the work area will be confined to the existing paved road adjacent to Portersville Bay and within the bay.

Given the above considerations, it is our opinion that the proposed undertaking will not affect significant cultural resources. If you agree with this determination, please sign this letter in the space provided below and return it to me at your earliest convenience.

Should you require additional information, please contact Ms. Dottie Gibbens at 205/694-4114. Your continued cooperation in the management of cultural resources under the jurisdiction of the Mobile District is sincerely appreciated.

Sincerely,

Hugh A. McClellan

Chief, Environment and Resources

Branch

Enclosure

CONCURRENCE:

F. Lawerence Oaks

Alabama State Historic

Preservation Officer

12-11-59

November 29, 1989

Coestal Environment Section

Mr. James L. Mason President, Mobile County Commission Post Office Box 1443 Mobile, Alabama 36633

Dear Mr. Mason:

Please reference previous correspondence to you regarding the Corps policy on the payment of fees to State agencies for State water quality certification. The State has indicated that it does not have legal authority to waive water quality certification fees for Corps dredging operations. We are in the process of requesting water quality certification from the Alabama Department of Environmental Management (ADEM) for construction of shoreline protection at Portersville Bay. We will request that ADEM process our request for certification to the point of issuance; however, they will not issue certification until the fee is paid. We request that you consider payment of the required fee of \$500.00.

We appreciate your patience and assistance in this matter. My point of contact on this project is Mr. Bill Youngman. If you have any questions or need additional information, he can be reached at 205/694-3881.

Sincerely,

N. D. McClure Chief, Plenning Division

Copy Furnished: PD-FC



United States Department of the Interior FISH AND WILDLIFE SERVICE



P.O. Drawer 1190 Daphne, Al 36526

December 7, 1989

District Engineer U.S. Army Corps of Engineers P.O. Box 2288 Mobile, AL 36628

Dear Sir:

This is the report of the U.S. Fish and Wildlife Service (Service) on Public Notice FP89-BC03-4, dated December 1, 1989. The Mobile District Corps of Engineers is proposing to perform shore protection work in the vicinity of Portersville Bay, Mobile County, Alabama. This report is prepared in accordance with the requirements of the Fish and Wildlife Coordination Act (16 U.S.C. 661-667e) and is to be used in your determination of 404(b)(1) guidelines compliance (40 CFR 230) and in your public interest review (33 CFR 320.4) as they relate to protection of fish and wildlife resources.

According to the public notice, two new segments of bulkhead (3700 and 5300 linear ft., respectively) would be constructed 3 feet seaward of the existing bulkheads at those sites. Additionally, about 2100 cu. yds. of rubble would be relocated from the vicinity of the existing bulkheads to the bay side of the new bulkheads to dissipate energy from wave action.

We do not expect that construction of the new bulkheads would result in direct significant impacts to fish and wildlife resources or their habitat. However, we are concerned about the potential for impacts to the extensive system of submerged aquatic grassbeds (primarily Halodule and Ruppia) that occur approximately 14 to 20 meters offshore of the existing bulkheads. Submerged grassbeds are extremely valuable as feeding and cover sites for fishery resources such as blue crab, shrimp, flounder, speckled seatrout, etc. Additionally, these beds stabilize the water bottom and export detrital material into the aquatic food chain.

The alternative described in your letter should result in minimal impacts to the nearby grassbeds provided all work is accomplished from the land and the work occurs in the winter (November to March) when the grassbeds are dormant and generally dewatered. Such measures should be specifically required in the project contract.

These views represent the position of the Department of the Interior. Please advise us of your action regarding this matter.

Sincerely yours,

Larry E. Goldman Field Supervisor

cc: EPA, Atlanta, GA
NMFS, Panama City, FL
ADCNR, Montgomery, AL
ADCNR, Spanish Fort, AL
ADCNR, Dauphin Island, AL
ADEM, Montgomery, AL
ADEM, Mobile, AL

December 12, 1989

Coastal Environment Section

Mr. Blake Roper
Alabama Department of
Emrironmental Munagement
2205 Perimeter Kosd
Hobile, Alabama 36615

Dear Mr. Ropers

Pursuant to the requirements of the Clean Water Act and Coastal Zone Management Act, water quality certification and coastal zone consistency certification are requested for proposed shoreline protection in the vicinity of Portersville Bay, Mobile County, Alabams. A description of the proposed action is contained within the enclosed public notice FP89-BCO3-4. The local sponsor of the project, Mobile County, has been motified of our new policy concerning payment of fees for water quality certification. They have indicated willingness to pay the fee.

Based on a review of the Alabama Coastal Zone Management Program, we find that the proposed action is consistent with the program to the maximum extent practicable.

Following your telephone approval, the enclosed Joint Public Notice Number FP89-BC03-4 was circulated on December 1, 1989. The required legal notice is being processed for publication in the Mubile Press Register, Mobile, Alabama. Proof-of-publication for the legal notice will be furnished to your office. Upon completion of the comment periods for the joint public notice and legal notice, we will provide copies of all comments received and appropriate responses to those comments for your consideration in making the final determination for certification.

A draft copy of the 404(b)(1) evaluation report for the proposed action is enclosed for your use. The draft EA will be sent under separate cover.

We appreciate your assistance. If you have any questions or need any further information, please contact Mr. Bill Youngman at 205/694-3881.

Sincerely,

N. D. McClure IV Chief, Planning Division

Enclosure

PD-EC/Flokes
PD-E/McClella
PD/McClery

AGNOLIA
CLIPPING SERVICE
ALABAMA DIVISION
2800 STM STREET
TUBEALDORA, AL 38401

MOBILE PRESS REGISTER

Mobile, Alabama WEEKEND

DEC -30-89

LEGAL NOTICE
OF
REQUEST FOR STATE CERTIFICATION
OF ACTIVITIES REQUIRING A
FEDERAL LICENSE OR PERMIT

_ADEM

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

March 22, 1990



Leigh Pegues, Director

1751 Cong. W. L. Dickinson Drive Montgomery, AL 36130 205 / 271-7700

Colonel Larry S. Bonine, District Engineer Mobile Corps of Engineers P. O. Box 2288
Mobile, Alabama 36628-0001

Field Offices

Unit 806, Building 8 225 Oxmoor Circle Birmingham, AL 35209

205/942-6168

P.O. Box 953

205/479-2336

2204 Perimeter Road Mobile, AL 36615 Re: Corps of Engineers federal project FP89-BC03-4/COEP-90-01

Dear Colonel Bonine:

The Alabama Department of Environmental Management has completed its review of the Corps of Engineers' proposal to construct new timber bulkheads in the vicinity of Portersville Bay, Mobile County, Alabama. The proposal calls for new bulkheads (one 3700 feet, the other 5600 feet) to be placed in front of existing deteriorating bulkheads to provide protection from severe erosion. The bulkheads will consist of 2" x 8" vertical sheeting that would be backed by a non-woven filter fabric and backfilled with 4,400 cubic yards of pervious soil.

The Corps of Engineers advertisement of the project by joint public notice with ADEM has been completed. On the basis of all materials submitted and associated with the proposal, it is the opinion of the technical staff that a decision relative to water quality and coastal certification is appropriate.

Action pertinent to water quality and coastal management certification is required by Section 401(a)(1) of the Clean Water Act, 33 U.S.C. §1251, et. seq., and the Alabama Coastal Area We hereby issue official certification Management Program. that there is reasonable assurance that the discharge resulting from the proposed activities as submitted will not violate applicable water quality standards established under Section 303 of the Clean Water Act and Title 22, Section 22-22-9(g), Code of Alabama (1975). We certify that there are no applicable effluent limitations under Sections 301 and 302 nor applicable standards under Sections 306 and 307 of the Clean Water Act in regard to the activities specified. Further, we hereby certify that the project has been found to be consistent with the Alabama Coastal Area Management Program conditional upon continued compliance with the 'management program. This certification in no way purports to

Colonel Larry S. Bonine Page Two

vest in you title to lands now owned by the State of Alabama nor shall it be construed as acquiescence by the State of Alabama in your possession of lands now owned by the State of Alabama.

Sincerely,

James W. Warr Deputy Director

JWW/BR/ct

cc: Bill Youngman

Mobile District Corps of Engineers

Hugh Swingle

AL DCNR, Dauphin Island

Bill Kruczynski

USEPA, Gulf Breeze

Sandy Tucker USFWS, Daphne

Buc



United States Department of Commerce National Oceanic and Atmospheric Administration NATIONAL MARINE FISHERIES SERVICE Southwast Regional Office 9450 Koger Boulevard St. Petersburg, FL 33702

March 29, 1990 F/SER113/DN

Colonel Larry S. Bonine
District Engineer, Mobile District
Department of the Army, Corps of Engineers
P.O. Box 2288
Mobile, AL 36628

Dear Colonel Bonine:

The National Marine Fisheries Service has reviewed Public Notice number FP89-BC03-4 dated December 1, 1989. The Mobile District Corps of Engineers proposes to construct a wooden bulkhead and place riprap at the toe in waters and wetlands of Portersville Bay, Mobile County, Alabama.

After reviewing the information provided and discussions with personnel from the Environmental Protection Agency and U.S. Fish and Wildlife Service, we do not object to construction of the project as proposed. If you have any questions, please contact Mr. David Nixon of our Panama City Area Office at 904/243-5061.

Sincerely yours,

Andreas Mager, Jr.

Assistant Regional Director Habitat Conservation Division

Enclosure 8



CESAMPD-EC (1105)

Mr. Youngman/wmy/28 Mar 1990

MEMORANDUM FOR RECORD

SUBJECT: Portersville Bay

1. I spoke with Mr. Bill Kruczynski of the Environmental Protection Agency concerning their comments on the above project (FP89-BC03-4). He said that he had not seen the public notice and asked that I describe the project to him. After doing so, he said that the EPA would have no comment on the project.

William M. Youngman

APPENDIX A

GEOTECHNICAL REPORT

GENERAL NOTES

Boring logs shown on the following sheets shall not be copied or altered.

Groundwater depths or elevations shown on the boring logs represent ground-vater encountered on the dates shown. Absence of groundwater data on certain borings implies that no data is available, but does not necessarily mean that groundwater will not be encountered at the locations. Groundwater elevations vary and seepage above the depths or elevations shown can be expected at any time.

While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local minor variations in characteristics of the subsurface materials of the region are anticipated and, if encountered, such variations will not be considered as differing materially from the description shown with the logs or profiles.

Soils are classified in accordance with the Unified Soil Classification System, Technical Memorandum No. 3-357 dated April 1960 for civil projects and Military Standard 619B dated 12 June 1968 for military projects.

Driving resistances (blow counts or N values) are determined with a standard split spoon sampler (1-3/8" I.D.) and a 140-1b driving hammer with a 30" drop unless otherwise noted on the boring logs. N values shown numerically on the logs are the sum of blows for the lower two of three 0.5-foot drives that make up the 1.5-foot Standard Penetration Test, except when refusal occurs. Refusal of the splitspoon is defined as 50 blows in less than a 0.5-foot drive. Refusal is shown on the logs as indicated in the following examples:

- 50/0.3' Indicates 50 blows (refusal) at depth 0.3' in the first 0.5-foot drive.
- 20, 50/0.2' Indicates 20 blows in the first drive and refusal at depth 0.2' in the second 0.5-foot drive.
- 20, 85/0.8' Indicates 20 blows in the first drive, 35 blows in the second drive and refusal (50 blows) at depth 0.3' in the third 0.5-foot drive.

"Max size" of gravel or rock fragments shown on the boring logs represents the maximum size of material recovered in the drive sampler and/or core barrel, or observed from augering. "Max size " is that size inferred by the field inspector from examination of broken samples, or noted by the driller from the drilling operation. Note that the maximum logged size of gravel or rock fragments is likely to be smaller than the maximum size of the in-place material, especially when the maximum logged size is more than approximately one-half the diameter of the drive sampler or core barrel, or more than one-third the diameter of the auger.

LEGEND --

COARSE-GRAINED SOILS - MORE TEAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE

GW WELL GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES

GP POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES

GM SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES

GC CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES

SW WELL GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES

SP POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES

SM SILTY SANDS, SAND-SILT MIXTURES

SAME AS ABOVE WITH HIGH LIQUID LIMIT

SC CLAYEY SANDS, SAND-CLAY

SC-H SAME AS ABOVE WITH HIGH LIQUID LIMIT

FINE-GRAINED SOILS - MORE THAN HALF OF MATERIAL IS <u>SMALLER</u> THAN NO. 200 SIEVE SIZE

INORGANIC SILTS AND VERY
FINE SANDS, ROCK FLOUR.
SANDY SILTS OR CLAYEY SILTS
WITH SLIGHT PLASTICITY

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OL ORGANIC SILTS AND ORGANIC SILT-CLAYS OF LOW PLASTICITY

OH ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS

INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY,
GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS,
LEAN CLAYS

CH INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS

PEAT AND OTHER HIGHLY ORGANIC SOILS

BITUMEN (AC)

CONCRETE (PCC)

NOTES:

MOT SAMPLES OR NOT RECOVERED

DUAL CLASSIFICATIONS, E.G. SP-SM, GP-GM, ML-CL

AND SM-SC, WILL BE SHOWN BY PLACING BOTH SYMBOLS

SIDE BY SIDE.

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3 . 66. 7	E	BAYOU L	LABATRE AL.	E. DATUM	FOR ELEVA	TION SHOW	N (TBM, MSL or NG)	(D)	
2. LOCATION			ration) N 135619 E 271500	12 244 24 00	ACTORER'S	DEC. St T.	NGVD		
3. DRILLING A				LIK. HARUF	WE I OMEN'S	UZSIGNATIO F	N OF DRILL AILING 314		
			LE DISTRICT	IS. TOTAL	NO. OF OVE	R-	DISTURBED	MOSTURED	
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6. DIRECTION	NE WA ?	D.	BOWDEN	IS. ELEVA	TION GROUNE	DWATER		COUNTERED	
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7. THICKNESS					CORE RECO				
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L PROJECT	PORTERSVII			NO TYPE OF	BIT	6° AL	JG.	
	BAYOU LAB	ATRE AL.	H. DATUM	FOR ELEVA	TION SHOW	N (TBM, MSL or NGVE	ii	
2. LOCATION (Coordingtes or Sta ZONE AL W: N	135683 E 271002	12 4/44	ACTORCOIC	DECICALTIC	NGVD		
3. DRILLING AC	ENCY		IC. MANUF	ACTORER'S		N OF DRILL AILING 314		
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4. HOLE NO. (A	la shown on drawin humber)	9 1116 PB-2-89	ļ			5		
S. NAME OF D		200000		NUMBER CO			*******	
6. DRECTION		BOWDEN	+	TION GROUNE	JWATER	GW. NOT EN	COUNTEREL	
	L PICLINED	DEG. FROM VERTICAL	16. DATE	HOLE		28 JUNE 89	28 JUNE	
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	LED INTO ROCK			CORE RECO		BORING		
9. TOTAL DEP		15.01	_19. SIGNAT	UPE OF INS		ONES	G.H.	DECOM
ELEVATION	DEPTH LEGEND	CLASSIFICATION OF MATERIAL	.s	Z CORE		REM	APIKS	1 <u>. </u>
4.4	b c	(Description) d		Z CORE RECOVERY OR W.C.	SAMPLE NO.	Orilling time, wat	er loss, depth 11 significan	n of nt)
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PORTERSVILLE BAY BAYOU LABATRE AL. II. DATUM FOR ÉLÉVATION SHOWN (TBM, MSL OF NGVD) ZONE AL W: N 135746 E 270507 3. DRILLING AGENCY MOBILE DISTRICT 4. HOLE NO. (As any any of the proper) S. NAME OF DRILLER D. BOWDEN B. DRECTION OF HOLE X VERTICAL INCLINED DEG, FROM VERTICAL TOTAL NO. OF DIVER-BURDEN B. DATE HOLE STARTED COMPLETED 15. ELEVATION TOP OF HOLE 28 JUNE 89 28 JUNE 89 17. ELEVATION TOP OF HOLE W. TOTAL CORE RECOVERY FOR BORNIG 18. TOTAL CORE RECOVERY FOR BORNIG 19. SIGNATURE OF INSPECTOR B. SIGNATURE OF INSPECTOR B. SIGNATURE OF INSPECTOR DEAFTED DEGETION CONTRIBUTED DEAFTED DESCRIPTION B. TOTAL CORE RECOVERY FOR BORNIG 19. SIGNATURE OF INSPECTOR DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DEAFTED DESCRIPTION DESCRI							H	Ole No.	PB-3-89		
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ENCY FORM #355 PORTERSYLLE BAY MALE A BA			BAYOU	LABATRE AL.				TBML MSL OF NGVI))		
S. DIRLING SECRY MOBILE DISTRICT 4. HOLE SO, LAR answer on drowing this PB-3-89 ENGETION OF PORLED D. BOWDEN D. BOWDEN S. ELEVATION ORD MARKET START D. BOWDEN S. ELEVATION ORD MARKET START D. BOWDEN S. ELEVATION ORD MARKET START D. BOWDEN S. ELEVATION ORD MARKET START D. BOWDEN S. ELEVATION ORD MARKET START D. BOWDEN S. ELEVATION ORD MARKET START D. BOWDEN S. ELEVATION ORD MARKET START D. BOWDEN S. ELEVATION ORD MARKET START D. BOWDEN S. ELEVATION ORD MARKET START D. BOWDEN S. ELEVATION ORD MARKET START D. BOWDEN S. ELEVATION OR MARKET S	2. LOCATION (Coordinate	s or Sta	rion)	7			NGVD			
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E. DECLYCHO OF HALE DOCUMENTICAL DOCUMENTO DOCU	S. NAME OF D	RILLER	······································		H. TOTAL	NUMBER CO	RE BOXES				
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ENCE FORM RISE DEC. FROM VERTICAL DEC. FROM VERTICAL T. RELEVATION TOP OF MICE 4.8 T. TOTAL LORGE RECOVERY FOR BORNOC S. SCHALLER FROM SOME S. SCHALLER FROM SOME D. JONES G. J. S. CORRES G. J. S. CORRES G. J. J. S.					S. DATE H	IOLE					
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A.S. OCH PARK CRAY INORGANIC CLAYEY LECT FORM 1835 A.S. OF FORM 1835	7. THICKNESS	of overbut	ROEN						.5		
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(ML) TAN CLAYEY SILT (ML) TAN CLAYEY SILT (SM) DARK GRAY SILTY SAND W/ TRACE DECOMPOSED ROOTS (SM) DARK GRAY & YELLOW SILTY SAND (SM) ORANGE SILTY SAND (SM) ORANGE SILTY SAND JAR 12.0 (MH) DARK GRAY INORGANIC CLAYEY SILT SILT FROME FORM 1836 FROME TO PORTERSVILLE BAY PORTERSVILLE BAY	S. TOTAL DEP	TH OF HOLE		15.0′				ONES			
(ML) TAN CLAYEY SILT (ML) TAN CLAYEY SILT (SM) DARK GRAY SILTY SAND W/ TRACE DECOMPOSED ROOTS (SM) DARK GRAY & YELLOW SILTY SAND (SM) ORANGE SILTY SAND (SM) ORANGE SILTY SAND JAR 12.0 (MH) DARK GRAY INORGANIC CLAYEY SILT SILT FROME FORM 1836 FROME TO PORTERSVILLE BAY PORTERSVILLE BAY	ELEVATION	DEPTH	LEGEND		.S	% CORE	BOX OR	Oction the REN	IARKS		
(ML) TAN CLAYEY SILT JAR SILTY SAND W/ TRACE DECOMPOSED ROOTS (SM) DARK GRAY SILTY SAND W/ TRACE DECOMPOSED ROOTS (SM) DARK GRAY & YELLOW SILTY SAND JAR 3 (SM) DRANGE SILTY SAND JAR 3 (SM) DARK GRAY INORGANIC CLAYEY SILT BLOH ENG FORM 836 FRAMET PORTERSVILLE BAY	4 8					OR W.C.	NO.		if significant)		
TRACE DECOMPOSED ROOTS (SM) DARK GRAY & YELLOW SILTY SAND (SM) ORANGE SILTY SAND JAR 12.0 (MH) DARK GRAY INORGANIC CLAYEY SILT SILT FINALE PROMISE PORTERSVILLE BAY PORTERSVILLE BAY PORTERSVILLE BAY		1111111		(ML) TAN CLAYEY SIL	Τ		JAR		- Coron		
(SM) DARK GRAY & YELLOW -4.2 S.O (SM) ORANGE SILTY SAND JAR -10.2 IS.O I		4.5					JAR #2				
-4.2 9.0 (MH) DARK GRAY INORGANIC CLAYEY -10.2 15.0 B.O.H. ENG FORM 1836 PROJECT PORTERSVILLE BAY					.Ow						
-IO.2 IS.O - IS.	-4.2	9.0		(SM) ORANGE SILTY SAF	ND						
ENC FORM 1836 PROJECT PORTERSVILLE BAY		12.0		(MH) DARK GRAY INORGANIC SILT	CLAYEY		JAR *5	B. O.H.			
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				i FURTI	ERSVILLE I LABATR	E AL.					

						H	ole No.	PB-4-89
DRILL	ING LOG	;	SOUTH ATLANTIC	INSTALLA"		LE DIST	PICT	SHEET
L PROJECT		OBTESC	VILLE BAY	IO. SIZE AL	NO TYPE OF			AUG.
			BATRE AL.	L			(TBM, MSL or N	
2. LOCATION (C	oordinate	8 or 510	ntion)				NGVD	
3. DRILLING AG		W: N 13	5793 E 270002	12. MANUF	ICTORER'S		N OF DRILL AILING 314	
		MOBIL	E DISTRICT	IS TOTAL	NO. OF OVE		DISTURBED	UNDISTURBED
4. HOLE NO. IA		on drawin	PB-4-89	BURDEN	SAMPLES	TAKEN	6	1
and file no 5. NAME OF DR				14. TOTAL	NUMBER CO	ME BOXES		
	_	D.	BOWDEN	IS. ELEVAT	ION GROUND	WATER	GW. NOT	ENCOUNTERED
6. DIRECTION O				16. DATE H	OLE		STARTED 28 JUNE 89	28 JUNE 89
X VERTICAL	L	CLINED	DEG. FROM VERTICAL	IT FIEUAT	ION TOP OF			1.7
7. THICKNESS (OF OVERBUR	RDEN			CORE RECO			1.1
8. DEPTH DRILL	LED INTO R	OCK			JAE OF INS	PECTOR		DRAFTED DECK
9. TOTAL DEPT	H OF HOLE	· · · · · · · · · · · · · · · · · · ·	15.0′		1		ONES	G.H. 10 8
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIAL (Description)	5	X CORE	SAMPLE	Orilling time.	REMARKS water loss, depth of
.4.7	0.0	С	d		OR W.C.	NO.	weathering,	etc If algnificant) g SPT 8LORS //
	3.0		(SM) DARK GRAY SILTY S	AND		JAR •i		
	4.5		(SM) DARK GRAY SILTY SAN TRACE (ML) LAYERS	D W/		JAR ■2		۵
	6.0		(SM) DARK GRAY SILTY S	AND		JAR *3		
	7.5		(SM) DARK GRAY SILTY S. W/ TRACE DECOMPOSED R			JAR •4		
-4.3			(SM) ORANGE SILTY SAN	ID		JAR #5		
-10. 3	12.0		(ML) DARK GRAY CLAYEY (SANDY)	SILT		JAR ≅6	B.O.H.	
ENG FORM	1836	-	PROJECT PORTERS	SVILLE B	AY	<u> </u>	HELE	
CADD Food			BAYOU L	ABATRE	AL.			PB-4-89
			A-8					

							iole No.	PB-5-89
DRILL	ING LOG	į	SOUTH ATLANTIC	MSTALLA		LE DIS		SHEET
IL PROJECT	B00	TEPE		IO. SIZE A	NO TYPE OF			AUG.
	BAYO	LL LA	WILLE BAY BATRE AL	E DATUM	FOR ELEVA	TION SHOW	N (TBM, MSL or I	NGVD)
Z. LOCATION (Coordinates of ZONE AL		rion) 5804 E 269505	12 1444	ACTORENCE S	NECONO TO	NGVD	
3. DRILLING AC	ENCY			IC. MANUF	ACTORER'S I		N OF DRILL AILING 314	
4 HOLE NO IA	a shown on d		DISTRICT	IS. TOTAL	NO. OF OVE	R-	DISTURBED	UNDSTURBED
gna THE N	umber)		PB-5-89		NUMBER CO		<u> </u>	·······
S, NAME OF DI	MILLEN	D. E	BOWDEN		TION GROUNE		GW, NOT	ENCOUNTERED
6. DIRECTION (M. DATE	HOLE		STARTED .	COMPLETED
X VERTICA	L NCINE	D	DEG. FROM VERTICAL		TION TOP OF		28 JUNE 89	
	OF OVERBURDEN				CORE RECO			
	LED INTO ROCK		15.04		UPE OF INS	ECTOR		DRAFTED DEC
9. TOTAL DEPT	<u> </u>	. т	15.0' CLASSIFICATION OF MATERIALS		1 y coer !		ONES	G.H.D
ELEVATION		END C	(Description)		X CORE RECOVERY OR W.C.	BOX OR SAMPLE NO. 1	Orising time.	REMARKS water loss, depth of etc1f significant) g SPT 8L085/F
1.5	3.0		(CL) TAN & GRAY SANDY C	LAY		JAR ●[
	4.5		(SM) DARK GRAY SILTY SANI TRACE SHELL FRAGS.) W /		JAR =2		
	6.0		(SM) ORANGE SILTY SANI	Ď		JAR #3		
:	7.5		(SM) YELLOW SILTY SAN	D		JAR *4		
-4.0	85		(SM) ORANGE SILTY SANG)		JAR =5		
	10.5		(MH) DARK GRAY INORGANIC CI SILT	LAYEY		JAR ●6		
-10.5	12.0		(MH) DARK GRAY INORGANIC C SILT	LAYEY		JAR ≉7	В.О.Н.	
-	unlunlun							
ENG FORM	1835		PORTER PORTER	SVILLE	BAY		1.00	ss. PB-5-89

DRILLING LOG SOUTH ATLANTIC MOBILE DISTRICT OF I SHEETS D. SIZE AND TYPE OF BIT OF ISHETS D. SIZE AND TYPE D. SIZE AND TYPE D. SIZE AND TYPE D. SIZE AND TYPE D. SIZE AND T. BALLING D. SIZE AND T. BALLING D. SIZE AND T. BALLING D. SIZE AND T. BALLING D. SIZE AND T. BALLING D. SIZE AND T. BALLING D. SIZE AND T. BALLING D.				PRIISION	MAT YA	71001	<u>H</u>	lole No.	PB-6-89
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-IO.7 IS.O SILT B.O.H. ENG FORM 1836 PORTERSVILLE BAY PRICE-R9		_		SIL I			-6		
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ENG FORM 1836 PORTERSVILLE BAY PR-6-89			<u> </u>			<u>L</u>	<u> </u>	1	
(CADO Fedelimine) BAYOU LABATRE AL.				PORTER	SVILLE B	AY		1	PR-6-89
	(CADO Foci	imile)		i BAYOU L	ABATRE	AL.		ſ	

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				1		H	iole No.	PB-7-89
DRILL	ING LOG		SOUTH ATLANTIC	POTALLA		LE DIS	TRICT	SHEET I OF SHEETS
L PROJECT			ILLE BAY		NO TYPE OF	BIT	6.	AUG.
2. LOCATION (C			BATRE AL.	N. DATUM	FOR ELEVA	TION SHOW	N (TBM, MSL or NO	(AAD)
	ZONE AL		138890 E 268501	12. MANUF	ACTORER'S	DESIGNATIO	NGVD N OF DRILL	
3. DRILLING AG		40BIL	E DISTRICT			F	AILING 314	· · · · · · · · · · · · · · · · · · ·
4. HOLE NO. (A	a shown on			BURDEN	NO. OF DVE	R- TAKEN	ESTURBED 6	UNCUSTURNED
and file n				H. TOTAL	NUMBER CO	RE BOXES		
S. HARRE OF DI	MLLER	D.	BOWDEN	15. ELEVAT	TION GROUNE	WATER	GW. NOT E	NCOUNTERED
6. DIRECTION O				S. DATE	HOLE		STARTED 28 JUNE 89	28 JUNE 89
X VERTICAL	MCLE	€D	DEG. FROM YERTICAL	IT. ELEVAT	TION TOP OF		4.	
7. THICKNESS C				-	CORE RECO			
B. DEPTH DAILL		<u> </u>	15.00	19. SIGNAT	UPE OF INSI		ONEC	DRAFTED DECEM
S. TOTAL DEPT			15.0' CLASSFICATION OF MATERIAL	<u> </u>	y coes	BOX OR	ONES	G.H. DE
ELEVATION G 4.0	DEPTH LI	C	(Description) d		% CORE RECOVERY OR W.C.	SAMPLE NO.	Oriting time, weathering, a	rater loss, depth of itc., if significant) g SPT 8.085/FT
	3.0		(SM) DARK GRAY SILTY SA	AND		JAR		
	4.5		(SM) TAN SILTY SAND			JAR =2		
	6.0		(SM) GRAY SILTY SAND			JAR •3		
3.5	7.5		(SM) GRAY & ORANGE SILTY	SAND		JAR ●4		
 	9.0		(MH) GRAY INORGANIC CLAYEY (SANDY)	Y SILT		JAR ●5		
-ILO	7. 1111111111111111		(MH) DARK GRAY INORGANIC C SILT	LAYEY		JAR ●6	B.O.H.	
ENG FORM (CADD Face)			PORTE BAYOU	RSVILLE LABATR	BAY RE AL.		and a	PB-7-89

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				1 -	NOTE ON	METALL	TION		icie No.	PB-8-89
DRILL	ING LOC	3		l o	SOUTH ATLANTIC	MOBILE DISTRICT OF 1 SMEETS				
L PROJECT					VILLE BAY	IO. SIZE A	IND TYPE OF			* AUG.
		BAY	'0U	LA	ABATRE AL.	A. DATUM	FOR ELEVA	TION SHOW	N (TBM, MSL or	
2. LOCATION (Coordinate	88 O	r 5† W.	at! N	Ion) 136059 E 26804I	<u></u>			NGVD	
3. DRILLING AG						IZ. MANUF	ACTORER'S		N OF DRILL AILING 314	
		M	OBI	LE	DISTRICT	13. TOTAL	NO. OF OVE	R-	OSTUME!	UNDISTURBED
4. HOLE NO. (A	s shown	90 0	3 Ov	Ing	†1†le PB-8-89	BURDE	N SAMPLES	TAKEN	7	
5. NAME OF DE						H. TOTAL	NUMBER CO	RE BOXES		
			D.	. в	OWDEN	S. ELEVA	TION GROUNE	WATER	GW. NOT	ENCOUNTERED
6. DIRECTION C						16. DATE	HOLE	- :	STARTED	COMPLETED
X VERTICA	r 🗀 🙀	CLM	ED		DEG. FROM VERTICAL	17 E EVA	TION TOP OF		28 JUNE 89	28 JUNE 89
7. THICKNESS	OF OVERBLE	RDEN		_			CORE RECO		BORNG	7.3
A DEPTH DRILL	LED MTO R	OCK					URE OF INS			DIANTED CORPUS
9. TOTAL DEP	TH OF HOLE				15.0′	<u> </u>		D. J	ONES	G.H. DE
ELEVATION	DEPTH	LE	GENO		CLASSIFICATION OF MATERIAL (Description)	S	X CORE	BOX OR SAMPLE	Orilling time	REMARKS
4.3	0.0		C		d		OR W.C.	NO.	veathering	etc if significant) g SPT BLOWS/FT
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	6.0						-		1	
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	7.5	11		1 !				•4	ļ	•
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	=	!	111		(SM) YELLOW SILTY SAN	iD		JAR #5		
-4.7	9.0 -	1	Ш	L						
		j		•	(MH) ORANGE INORGANIC CL	AYFY	1	JAR		
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ENG FORM					PORTE PORTE	RSVILLE	BAY		HOL	PB-8-89
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			DIVISION	DESTALLA	Time	н	ole No.		PB-9-89
	ING LOG	;	SOUTH ATLANTIC	- ALLA		LE DIST	RICT		SHEET OF SHEETS
L PROJECT			SVILLE BAY ABATRE AL.		NO TYPE OF			6" AUG.	
2. LOCATION (C	oordingte	s or Stat	rion)	- DATUM	FUR CLEVA	IUN SHUTT	NGVD	or MGVD)	
3. DRILLING AG		AL W: N	136293 E 267600	12. MANUF	ACTORER'S				· · · · · · · · · · · · · · · · · · ·
			DISTRICT	IS. TOTAL	NO, OF DVE		AILING 3	514 UPBED	; UPDSTUPED
4. HOLE NO. (A	a ahown (on drawing	PB-9-89		NO. OF OVE			7	!
S. NAME OF DE			200051		NUMBER CO			======	
6. DIRECTION C	XF HOLE	υ. ε	BOWDEN	 	TION GROUND	WATER !	STANTED	EE REMAR	KS'
X VERTICAL		CLINED	DEG. FROM VERTICAL	IS. DATE I	HOLE 		28 JUNE	89	28 JUNE 89
7. THICKNESS		ROEN			DON TOP OF			4.8	3
A DEPTH DALL				1	CORE RECO		10.00		DECEMBER OF CHE
9. TOTAL DEPT	TH OF HOLE		15.0′			D. J	ONES		G.H.
ELEVATION 4.8	DEPTH D.O	LEGEND C	CLASSFICATION OF MATERIAL (Description) d	\$	X CORE RECOVERY OR W.C.	BOX OR SAMPLE NO.	Oriting weathe	REMARK time, water tring, etc it	S loas, depth of Palgnifloant) SPT 8LOWS/FT
4.8 1.8	3.0		(SC) DARK BROWN CLAYEY SA TRACE GRAVEL (1/4'-1/2			JAR		<u> </u>	
0.3	4.5 —		(ML) DARK GRAY CLAYEY SIL SOME SHELL FRAGS. (SAN			JAR *2		NIT. ENC.	
	6.0_		(SM) DARK GRAY SILTY SAN TRACE SHELL FRAGS.	D W/		JAR *3	FINA	AL WL NOT	OBS.
	7.5		(SM) TAN SILTY SAND			JAR •4			
-4.2	9.0		(SM) YELLOW SILTY SAN	(D		JAR •5			
			(MH) TAN INORGANIC CLAYEY	SILT		JAR •6			
-10-2	12.0		(MH) DARK GRAY INORGANIC (SILT	CLAYEY		JAR ¶7	B.O.H.		
ENG FORM			PORTE BAYOU	RSVILLE LABATR	BAY E AL.			HELE WA	PB-9-89

		DIVISION	Bet 7 ALL A	Tarre		lole No.	PB-10-89
	ING LOG	SOUTH ATLANTIC	PESTALLA		LE DIS	TRICT	SHEET OF SHEET
I. PROJECT		RSVILLE BAY LABATRE AL.		NO TYPE OF		6' AL	
	Coordingtes or	Station)	- L. DATUM	FOR ELEVA	INON SHOW	NGVD	1)
3. DRILLING AG		136533 E 267157	12. MANUF	ACTORER'S	_	N OF DRILL	
J. (MILLING AU	MOE	BILE DISTRICT	IS TOTAL	NO. OF OVE		AILING 314	UNDESTURBED
4. HOLE NO. LA	a shown on dro	PB-10-89	BURDEN	SAMPLES	TAKEN	5	
S. NAME OF DE	RILLER			NUMBER CO		4555	Duca
6. DIRECTION C		D. BOWDEN	+	ION GROUNE	DWATER	STARTED STARTED	COMPLETED
X VERTICAL		DEG. FROM VERTICAL	M. DATE	OLE		29 JUNE 89	29 JUNE 8
7. THECKNESS	OF OVERBURDEN		——	ION TOP OF		3.0	<u> </u>
& DEPTH DAL	LED BITO ROCK			CORE RECO		SCR9G	DRAFTED : DE
S. TOTAL DEPT	TH OF HOLE	15.0′			D. J	ONES	G.H. 🕥
ELEVATION 3.6	DEPTH LEGEL	CLASSFICATION OF MATERIA (Description)	u.s	X CORE RECOVERY OR W.C.	BOX OR SAMPLE NO.	Oriting time, wat weathering, etc	ARKS or loss, depth of in 11 significant) o SPT BLOS
		(SM) DARK BROWN SILTY S	AND W/		JAR		
		LITTLE SHELL FRAGS			JAR. ●j		
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0.6	3.0		 	ļ	 	GW. INIT. ENC.	
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		(ML) DARK GRAY CLAYEY S SOME SHELL FRAGS			JAR #2		
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		(MH) TAN & GRAY INORGANIC	CLAYEY		JAR •4	}	
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	13.5	!				<u>.</u>	
		: (MH) DARK GRAY INORGANIC	CLAYEY		JAR	-	
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-11.4	15.0			 	<u> </u>	В.О.Н.	
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ENG FORM		PROJECT DOOR	TERSVILLE		<u></u>		

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					,		H	ole No.	PB-11-89
DRILL	ING LOC	;	Ì	DIVISION SOUTH ATLANTIC	INSTALLA		LE DIST	RICT	SHEET OF SHEETS
L PROJECT		PUD.	TER	SVILLE BAY	IO. SIZE A	NO TYPE OF			AUG.
		BAYO	U L	ABATRE AL.	IL DATUM	FOR ELEVA	TION SHOWN	(TBM, MSL or I	
2. LOCATION (C	pordinate	s or	Sta	rtion) I 136915 E 266883	12 144	CTOSEPIC I	NEED NO.	NGVD	
3. DRILLING AG	ENCY				IK. MANUF	ACTORER'S		N OF DRILL AILING 314	
				E DISTRICT	13. TOTAL	NO. OF DVE	R-	DISTURBED	UNDISTURBED
4. HOLE NO. (A)	a ahown (umber)	a n a n	. GA JU	PB-II-89		SAMPLES		: 4	
5. NAME OF DR						NUMBER CO		<u> </u>	5
6. DIRECTION O			D.	BOWDEN	P. ELEAN	TION GROUNE	WATER		ENCOUNTERED CONTERED
		~ ~		DEG. FROM VERTICAL	IS. DATE	OLE		EB JUNE 89	•
X VERTICAL				DEGLINGS VENICAL	17. ELEVA		HOLE		4.0
7. THICKNESS (IL TOTAL	CORE RECO	VERY FOR	BORING	
S. DEPTH DALL				15.0'	19. SIGNAT	LIFE OF INSI		ONES	G.H.
S. TOTAL DEPT	·			CLASSIFICATION OF MATERIAL	2.	Z CORE			REMARKS
ELEVATION O	DEPTH	LEG		(Description)		RECOVERY OR W.C.	BOX OR SAMPLE NO.	Oriting time,	water loss, depth of etc., If significant)
4.0	0.0	-				•	7		g SPT 8LOWS/FT
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	=		[CON DADY CDAY CH TH	w .				
				I (SM) DARK GRAY SILTY SAN I TRACE SHELL FRAGS.			JAR ●;		'
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	6.0_			(ML) DARK GRAY CLAYEY SI	LT W/		JAR		
				SOME SHELL FRAGS.			•2		
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-5.0	9.0			<u> </u>					
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;				(MH) DARK GRAY & ORAN			JAR		
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				(MH) DARK GRAY INORGANIC SILT	ULAYEY		JAR =4		
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ENG FORM	1636			PROJECT PORTE	RSVILLE	BAY		1400.0	
ICADO Foce				BAYOU	LABATR	E AL.			PB-II-89
				A-1	5				

<u> </u>			DIVISION	INSTALLA	TION	<u> </u>	iole No.	PB-12-89
	ING LOG		SOUTH ATLANTIC		MOB	ILE DIS	TRICT	SHEET OF SHEETS
L PROJECT			SVILLE BAY ABATRE AL.		NO TYPE DI		6' A	IUG.
2. LOCATION (Coordinate	a or Sto	ntion)				NGVD	,
3. DRELING AG			137250 E 266628	12. MANUF	ACTORER'S		N OF DRILL	
	· · · · · · · · · · · · · · · · · · ·		E DISTRICT	IS. TOTAL	NO. OF DVE		DISTURBED	UNDSTURBED
4. HOLE NO. (A and file n	musper)	u Graniu	PB-12-89		NUMBER CO		<u> 6</u>	i
S. NAME OF D	PALLER	ח	BOWDEN		ION GROUNE			NCOUNTERED
6. DIRECTION C	OF HOLE		00.000.11	IS. DATE	OLE		STARTED	COMPLETED
X VERTICA	T	LDED	DEG. FROM VERTICAL		TOP OF		29 JUNE 89	: 29 JUNE 89
7. THICKNESS	OF OVERBUR	N30			CORE RECO			.0
B. DEPTH DRE			ν <u>Ε</u> Ο΄	19. SIGNAT	LIFE OF MS		IONES	DRAFTED NEGLES
ELEVATION	1		15.0' CLASSFICATION OF MATERIAL	5	X CORE	BOX OR	ar ar	G.H. DE
4.0	DEPTH B O.O	LEGEND	(Description) d		RECOVERY OR U.C.	SAMPLE NO.	Oriting time, we weathering, et	rter loss, depth of c., if significant) g spr scots/fr
	11111111		(ML) DARK GRAY CLAYEY SIL SOME SHELL FRAGS.	.T w /		JAR ●I		
-0.5	3.0		(ML) DARK GRAY CLAYEY S	SILT		JAR ■2		•
	6.0		(SM) ORANGE SILTY SAN	Ď		JAR ●3		
-4.0	B.O =		(SM) DARK GRAY SILIY SA	AND		JAR •4		
			(MH) TAN INORGANIC CLAYEY W/ TRACE (SM) LENSES			JAR *5		
-li-O	13.5		(MH) DARK GRAY INORGANIC C	CLAYEY		JAR ■6	В.О.Н.	
ENG FORM			PROJECT PORTE BAYOU	RSVILLE LABATR	BAY RE AL.			PB-12-89

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						H	ole No.	F	B-!3-89
DRILL	ING LOC	 3	SOUTH ATLANTIC	INSTALLA		LE DIST			SHEET !
L PROJECT			VILLE BAY		ND TYPE OF	BIT		6º AUG.	
2. LOCATION (BATRE AL.	EL DATUM	FOR ELEVA	TION SHOW	NGVD	or NGVD)	
3. DRILLING AG	ZONE		138471 E 263753	12. MANUF	ACTORER'S				·
	MOBILE DISTRICT			G. TOTAL	NO. OF OVE	R-	04570	MACD.	, UNDERTURNED
4. HOLE NO. LA and file n	4. HOLE NO. (As shown on drowing title ps-13-89			BURDEN	NAMPLES	TAKEN	<u>: 6</u>	<u> </u>	:
S. NAME OF DRILLER D. BOWDEN					NON GROUNE		GW. NO	T ENCO	UNTERED
S. DIRECTION C	F HOLE			IS. DATE	OLE		STARTED		COMPLETED
X VERTICA		CLNED	DEG. FROM VERTICAL	IT. ELEVAT	TION TOP OF		29 JUNE	3.	29 JUNE 89
7. THICKNESS				<u> </u>	CORE RECO	···	BORNG		
B. DEPTH DRALI			15.0'	19. SIGNAT	UPE OF MIS		ONES		G.H.
ELEVATION	DEPTH	LEGEND	C ASSENTATION OF MATERIAL	\$	Z CORE	BOX OR		REMARK	,
3.5	0.0	c	d		OR W.C.	NO.	weather	ing, etc., if	loss, depth of significant; SPT BLOWS/FT
	3.0		(SM) DARK BROWN SILTY SAN TRACE SHELL FRAGS.	ND W/		JAR ®i			
-2.5	6.0		(SM) DARK GRAY SILTY SAN TRACE SHELL FRAGS.	D W/		JAR ■2			
	7.5_		(MH) BEIGE INORGANIC CLAYE	r SILT		JAR •3			
	9.0_		(MH) BEIGE INORGANIC CLAYE	r SILT		JAR =4			
i	12.0		(MH) GREEN INORGANIC CLAYE	Y SILT		JAR ■5			
n 5	11111111		(MH) GREEN INORGANIC, CLAYE	Y SILT		JAR ●6	B.O.H.		
-11.5	15.0					1	Ma Valla		
ENG FORM		L	PROJECT PORTEI	RSVILLE LABATR	BAY E AL.	<u> </u>		HOLE WA.	PB-13-89

							OLE NO.	<u> -6-1-</u>	- 3
DRILL	ING LOG	DIV	SOUTH ATLANTIC	MSTALLAT		I F DIST	TRICT	SHE	ET
L PROJECT	POR	TERSVI	LLE BAY	MOBILE DISTRICT OF I SHEETS 10. SIZE AND TYPE OF BIT 6" AUG.					
	BAYO	U LAB	ATRE AL.	IL DATUM FOR ELEVATION SHOWN (TBM, MSL or NGVD)					
2. LOCATION	Coordinates or ZONE AL	Statle W: N 13	n) 88595 E 263267	13 4444	CTORER'S	NEGOL TAN	NGVD		
3. DRILLING AC	ENCY			4. 487U	IL (URLEY'S E		AILING 314		
4 100 5 110 11			DISTRICT	IS TOTAL	NO. OF OVE	A-	CASTLANCED	; UM	DETURBED
יו פווד מיום		-	PB-14-89		NUMBER CO		6	<u>i</u>	
S. NAME OF D	RELER	D. RO	WDEN		ION GROUND		GW. NOT EN	OUNTE	RED
S. DIRECTION (OF HOLE	J. JO		M. DATE H		1	STARTED	5034	LETED
X VERTICA	L NCLHE	D	DEG. FROM VERTICAL				29 JUNE 89		JNE 89
7. THICKNESS	OF OVERBURDEN				CORE RECO		2.	.8	
	LED INTO ROCK				JAE OF INS		BORBIG	i SPA	PTED DE BE
S. TOTAL DEP	TH OF HOLE		15.0′				ONES		.H. 10
ELEVATION C 2.8	t 1	END	CLASSFICATION OF MATERIALS Description) d	•	X CORE RECOVERY OR W.C.	BOX OR SAMPLE NO.	Oriting time, water	., if signif	soth of flooriti SPT BLOSS/FT
-3.2	3.0		(SM) DARK BROWN SILTY SAN TRACE SHELL FRAGS. (SM) DARK GRAY & ORANGE SAND W/ TRACE SHELL FR. (MIC.) (SM) ORANGE & GRAY SILTY S. TRACE SHELL FRAGS. (MIC.)	SILTY AGS. AND W/		JAR JAR JAR JAR JAR			
	9.0		SILT W/ TRACE (SM) LAYE (MH) BEIGE INORGANIC CLAYEY W/ TRACE DECOMPOSED RO	' SILT OTS		JAR #5			
-12.2	15.0		(MH) GREEN INORGANIC CLAYE' (SANDY)	Y SILT		JAR ●6	В.О.Н.		
	mhulunlim						[value] the		
ENG FORM	1636		PROJECT PORTE	RSVILLE	BAY		1	PB-14	-89

			I amount				. н	ole No.	PE	3-15-89
DRILLING LOG DIVISION SOUTH ATLANTIC			MSTAL	MOBILE DISTRICT OF I SHEETS						
L PROJECT			RSVILLE E	IAY		ID. SIZE AND TYPE OF BIT 6° AUG. IL DATUM FOR ELEVATION SHOWN (TBM, MSL or NGVD)				
2. LOCATION (LABATRE	AL.	R. DATE	JM FOR ELEVA	TION SHOW!	NGVD	or NGVD)	
	ZONE			E 262814	I2. MAN	LIFACTORER'S		N OF DRELL		
3. DALLING AG	RUCY	MOBIL	E DISTRI	СТ	-			AILING 3	14 AND :	UNIOS TURBED
4. HOLE NO. (A	s shown o			PB-15-89	IL TOT	AL NO. OF DVE DEN SAMPLES	R- TAKEN	9837		
5. NAME OF DE			<u>-</u>		м. тот	AL NUMBER CO	ME BOXES			
D. BOWDEN				IZ. ELE	VATION GROUN	WATER		OT ENCOU		
6. DIRECTION O		-	nc.	. FROM VERTICAL	16. DAT	E HOLE		STARTED 29 JUNE	89 2	9 JUNE 89
				THOU VENTICAL	17. ELE	VATION TOP OF			4.0	
7. THOMESS						AL CORE RECO		BOTHIC		· · · · · ·
S. TOTAL DEP				15.0'	ig. Sice	LATURE OF INS		ONES		G.H.
ELEVATION	DEPTH	LEGENO		CLASSFICATION OF MA		X CORE	BOX OR		REMARKS	
4.0	0.0	c	ļ	d		OR W.C.	NO.	weathe	ring, etc., if	significant) SPT 8.083/FT
- 9.U.	-	ППП					<u> </u>		¥	- C. C. C. C. C. C. C. C. C. C. C. C. C.
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	=			DARK BROWN CLA			JAR •!			
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	3.0	11111								•
	7.0			. D. DV . DD 0 W . O						
	=		(SAN	DARK BROWN CLA DY) W/ TRACE SHE	AYEY SILI ELL FRAGS.		JAR •2			
	4.5							ł		
	=		(ML	DARK BROWN CL	AYEY SILT		JAR			
	6.0		(SAN	DY) W/ TRACE SHE	ELL PRAGS.		•3]		
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			(MI	DARK BROWN CLA	AYFY SILT		JAR			
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			(MH)	BEIGE & ORANGE CLAYEY SIL	INUKGANIC T	1	JAR #5			
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ENG FORM	1936		1990	ECT BOI	RTERSVILLE	BAY	<u> </u>		HEAL HA	
CADD Food					OU LABATE	RE AL.			P	B-15-89

MOBILE DISTRICT 4. HOLE NO. (As shown on drawing 111th PB-16-89 5. NAME OF DRILLER D. BOWDEN 6. DIRECTION OF HOLE T. THICKNESS OF OVERBURDEN MOBILE DISTRICT LS. TOTAL NO. OF OVER-BURDED BURDEN SAMPLES TAKEN M. TOTAL NUMBER CORE BOXES S. ELEVATION GROUNDWATER GW. NOT ENCOUNTERED E. DATE HOLE STARTED COMPLETED 29 JUNE 89 17. ELEVATION TOP OF HOLE 3.4									loie No.		PB-16-	89	
UNITED STATE AND LEGATION OF MALE ALL OF MALE AND LEGATION OF MALE AND	DRILL	ING LOC	;		SOUTH ATLANTIC	INSTALLA		IF DIS	TRICT	-			٦
DATO LABATRE AL. LOCATION (COOR PICE SECURITY SERVICE	L PROJECT		POR	TER		IO. SIZE A				6. AUC			1
3. DRILLED ACRES! MOBILE DISTRICT 4. INC. (10. Lise arrows on drowing 1119) DB-16-89 M. TOTAL NO. OF DYES. MINOR OF DRILLES D. BOWDEN C. ELEVATION CONDUSTATES CW. NOT ENCOUNTERED DECL. FROM VERTICAL T. INCLUSES OF OVERAIROS. A. TOTAL CORP. RECEIVED TO RICE D. FOR VERTICAL T. TOTAL SEPTEMBRIC STATES D. BOWDEN C. ELEVATION CONDUSTATES C. M. DATE NO.E T. TOTAL SEPTEMBRIC STATES TOTAL CORP. RECEIVED TO RICE LECUATION DEPTH LEED C. ASSISTATION OF MALE C. ASSISTATION		ŧ	BAYC	ו טו	LABATRE AL.	AL DATUM	FOR ELEVA	TION SHOW					7
S. DRILLEN ACCOUNT FALLING 314	2. LOCATION (ZONE AL	W:	N I	38955 E 262340	12. MANUF	ACTORER'S	DESIGNATIO					4
SINGLE OF CHILER D. BOWDEN S. MANE OF CHILER D. BOWDEN S. CLEVATION CROUNDENTRY CW. NOT ENCOUNTERED S. CLEVATION CROUNDENTRY CW. NOT ENCOUNTERED S. CLEVATION CROUNDENTRY CW. NOT ENCOUNTERED S. CLEVATION CROUNDENTRY CW. NOT ENCOUNTERED S. CLEVATION CROUNDENTRY CW. NOT ENCOUNTERED S. CLEVATION CROWNER CW. S. CLEVATION CROUNDENTRY CW. NOT ENCOUNTERED S. CLEVATION CROWNER CW. S. CLEVATION CROWNER CROWNER CW. NOT ENCOUNTERED S. CLEVATION CROWNER CW. S. CLEVATION CW. NOT ENCOUNTERED S. CLEVATION CROWNER CW. S. CLEVATION CW. S. CLEVATION CW. NOT ENCOUNTERED S. CLEVATION CROWNER CW. S. CLEVATION CW. S. CLE	3. DRILLING AG	ENCY	М	וופר	F DISTRICT			F	AILING 3				╛
SINGE OF PRICES D. BOWDEN C. DRECTION OF HOLE DEC. FROM VERTICAL DEC. FROM VERTICAL T. RECASSES OF PRICES S. DATE HOLE DEC. FROM VERTICAL DEC. FROM VERTICAL S. DATE HOLE T. REVATION DEC. PROBLED BY 29 JUNE 89 T. REVATION DEC. PROBLED BY 29 JUNE 89 T. REVATION DEC. PROBLED BY 3, 29 JUNE 89 T. REVATION DES. CONTROL BY 3, 4 T. REVATION DEC. PROBLED BY 3, 4 T. REVATI				IS. TOTAL	NO. OF OVE	R- TAKEN			960	STUPBED	1		
D. BOWDEN D. BOWDEN B. RELEVATION GO HOLE D. BOWDEN DEC. FROM VERTICAL D. BOWDEN DEC. FROM VERTICAL D. BOWDEN DEC. FROM VERTICAL D. BOWDEN DEC. FROM VERTICAL D. BOWDEN D. BOWE	and file n	umber)				H. TOTAL	NUMBER CO	RE BOXES	•		<u> </u>		
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7. INCOMESS OF OVERBURDED 2. INCOMESS OF OVERBURDED 3. A CORPT OF MALE 3. A CORPT OF MALE 3. A CORPT OF MALE 4. STOTAL CORPT RECOVERY FOR BOTHUS 5. STORIUS OF SEPECTOR 5. STORIUS OF SEPECTOR 5. STORIUS OF SEPECTOR 5. STORIUS OF SEPECTOR 5. STORIUS OF SEPECTOR 6. STORIUS OF SEPECTOR						16. DATE H	OLE			90			٦
THE COMPLETE OF THE CONTROL OF THE C					DEG. FROM VERTICAL	IT. ELEVAT	ION TOP OF		E3 00112		23 00		┪
S. TOTAL DEPTH OF MALE LECUSED C. C. ASSECTION OF MATERIALS C. C. ASSECTION OF MATERIALS C. C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERIALS C. ASSECTION OF MATERI					· · · · · · · · · · · · · · · · · · ·	IS. TOTAL	CORE RECO	VERY FOR	BORING			1	
ELEVATION DEPTH LEGEN CASSPICATION OF MATERIALS CONTROL OF MATERIALS CONTROL OF THE MATERIAL CONTROL OF THE MATERIAL CONTROL OF T			_			19. SICHAT	UPE OF INSI		ONES				7
(SM) BROWN SILTY SAND (SM) DARK GRAY SILTY SAND W/ TRACE SHELL FRAGS. (SM) BEIGE SILTY SAND (SM) BEIGE SILTY SA					CLASSIFICATION OF MATERIALS		Z CORE	BOX OR	· · · · · · · · · · · · · · · · · · ·		×S	-	爿
SM) BROWN SILTY SAND W/ TRACE SHELL FRAGS. (SM) DARK GRAY SILTY SAND W/ TRACE SHELL FRAGS. (SM) BEIGE SILTY SAND JAR *3 (MH) BEIGE & ORANGE INORGANIC CLAYEY SILT W/ TRACE (SM) LENSES (MH) GREEN INORGANIC CLAYEY SILT *5 (MH) GREEN INORGANIC CLAYEY SILT W/ TRACE (SM) LENSES *6 B.O.H.		b					OR W.C.	SAMPLE	Oriting 1	ring etc	it algniti	cont)	,,
SM) BROWN SILTY SAND W/ TRACE SHELL FRAGS. (SM) DARK GRAY SILTY SAND W/ TRACE SHELL FRAGS. (SM) BEIGE SILTY SAND JAR *3 (MH) BEIGE & ORANGE INORGANIC CLAYEY SILT W/ TRACE (SM) LENSES (MH) GREEN INORGANIC CLAYEY SILT *5 (MH) GREEN INORGANIC CLAYEY SILT W/ TRACE (SM) LENSES *6 B.O.H.			I	H			† · · · · · · ·						7
SM) BROWN SILTY SAND W/ TRACE SHELL FRAGS. (SM) DARK GRAY SILTY SAND W/ TRACE SHELL FRAGS. (SM) BEIGE SILTY SAND JAR *3 (MH) BEIGE & ORANGE INORGANIC CLAYEY SILT W/ TRACE (SM) LENSES (MH) GREEN INORGANIC CLAYEY SILT *5 (MH) GREEN INORGANIC CLAYEY SILT W/ TRACE (SM) LENSES *6 B.O.H.		=											F
SM) DARK GRAY SILTY SAND W/ TRACE SHELL FRAGS. (SM) BEIGE SILTY SAND JAR 3.0 (SM) BEIGE SILTY SAND JAR 3.7.5 (SM) BEIGE & ORANGE INORGANIC CLAYEY SILT (MH) GREEN INORGANIC CLAYEY SILT (MH) GREEN INORGANIC CLAYEY SILT (MH) GREEN INORGANIC CLAYEY SILT W/ TRACE (SM) LENSES BLO.H.		_=		† †	(SM) BROWN SILTY SAND)							F
(SM) DARK GRAY SILTY SAND W/ TRACE SHELL FRAGS. (SM) BEIGE SILTY SAND JAR 3 (SM) BEIGE SILTY SAND JAR 3 (SM) BEIGE SILTY SAND JAR 3 (SM) BEIGE SILTY SAND JAR 4 (SM) BEIGE SILTY SAND JAR 4 (MH) GREEN INORGANIC CLAYEY SILT (MH) GREEN INORGANIC CLAYEY SILT W/ TRACE (SM) LENSES JAR 6 BLO.H.				╽				•					F
(SM) DARK GRAY SILTY SAND W/ TRACE SHELL FRAGS. (SM) BEIGE SILTY SAND JAR 3 (SM) BEIGE SILTY SAND JAR 3 (SM) BEIGE SILTY SAND JAR 3 (SM) BEIGE SILTY SAND JAR 4 (SM) BEIGE SILTY SAND JAR 4 (MH) GREEN INORGANIC CLAYEY SILT (MH) GREEN INORGANIC CLAYEY SILT W/ TRACE (SM) LENSES JAR 6 BLO.H.		3.0_] [F
TRACE SHELL FRAGS. (SM) BEIGE SILTY SAND (SM) BEIGE & ORANGE INORGANIC CLAYEY SILT W/ TRACE (SM) LENSES (MH) GREEN INORGANIC CLAYEY SILT (MH) GREEN INORGANIC CLAYEY SILT (MH) GREEN INORGANIC CLAYEY SILT W/ TRACE (SM) LENSES JAR 4.5 JAR 6.0 (MH) GREEN INORGANIC CLAYEY SILT W/ TRACE (SM) LENSES B.O.H.			11.		(SM) DARK GRAY SH TY SAM) W/		JAR]				F
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APPENDIX B

COMPUTATION OF ECONOMIC BENEFITS

Appendix B

Computation of Economic Benefits

- 1. This appendix provides the methodology and computations by which economic benefits accruing to the proposed Federal project at Portersville Bay, Mobile County, Alabama, were computed.
- 2. Maintenance of Seawalls and Roads to Time of Failure. Information concerning annual expenditures for the period 1979-1987 for repairs and maintenance of the roadway was provided by Mobile County. Incremental maintenance costs (Table B-1) for seawalls and roads incurred as a direct result of the deteriorated condition of the existing seawalls and roadway averaged \$26,300 per year.

Table B-1

Annual Incremental Costs for Maintenance of Seawalls and Roads

1979	\$	93,000	(FEMA	Funds)
		12,000		
1980		12,000		
1981		12,000		
1982		12,000		
1983		12,000		
1984		12,000		
1985		36,100	(FEMA	Funds)
		12,000		
1986		12,000		
1987	_	12,000		
	\$ 2	237,000		

- 3. The average annual expenditures for extraordinary repairs were based on the county road supervisor's estimate of labor, equipment, and materials costs for necessary repairs, in addition to normal, expected maintenance costs, during the period.
- 4. The average annual maintenance and repair expenditures of \$26,300 for Shell Belt and Coden Belt Roads must be prorated, based on their linear distance open to wave attack (3,300 feet and 5,500 feet, respectively). Thus, the average annual expenditures attributable to the Shell Belt Road are \$9,900 (\$26,300 x 0.375) and to Coden Belt Road are \$16,400 (\$26,300 x 0.625). The roads will be

maintained for two years until the bulkheads fail. The annualized costs for maintenance and repairs are then computed as:

O & M Shell Belt Road: \$9,900 x 1.762099 x .090032 = \$1,571

0 & M Coden Belt Road: $\$16,400 \times 1.762099 \times .090032 = \$2,602$

Total Annualized Costs = \$4,173

- 5. Traffic Diversion. Higher costs are incurred when roadway users are force to travel alternative routes. Vehicles traveling alternative routes consume additional fuel and require additional maintenance and repairs when required to travel longer distances for a sustained period of time. The routes onto which traffic is diverted require increased maintenance and repair. Barriers and detour signs must be constructed and maintained. Accident rates may increase in greater proportion than the additional distance traveled due to congestion on the alternate route.
- 6. Average daily traffic counts used for this evaluation were developed by the Mobile County Engineering Department. The counts were based on actual traffic counting device recordings during the week of August 23, 1987. The counts are considered typical since both roads accommodate both residential and commercial users and are generally unaffected by seasonal traffic flows.
- 7. Average daily traffic counts for Shell Belt Road from each of two traffic counters placed on either end of the portion of the road along the water's edge, were 631 and 760. The average daily count equalled 696; the highest daily totals for these two traffic counters were 715 and 858. Average daily traffic counts for the Coden Belt Road was based on a single traffic counter placed at the west end of the project site during the same period. (The remaining counter placed at the east end of the road segment malfunctioned.) The average daily traffic count for Coden Belt Road was 815 vehicles; the highest daily total was 908.
- 8. Accurate directional analysis cannot be determined since neither surveys nor counts of entry and exist preference were undertaken. Therefore, the choices of direction are assumed to be equally distributed. Thus, traffic using either project road at the Portersville Ray study area site would be indifferent as to the choice of route traveled among equivalent alternatives.

- 9. However under normal conditions, traffic at the project site is constrained to use the paved perimeter roads (Figure B-1), described by routes ABCDEF and GHIJ. Other roads adjacent to the site of the proposed project are unpaved, poorly drained clay-dirt roads which are crossed at several locations by intermittent streams.
- 10. Points A and F at Shell Belt Road and Point G and J on Coden Belt Road were selected as the reference points for this analysis. Routes AFE and FABC are assumed to be representative of the average distances traveled east and west, respectively, on Shell Belt Road. Routes GJI and JGH are assumed to be representative of distances traveled on Coden Belt Road. Benefits to the project from traffic diversions would be the difference in the annualized costs to traffic using existing routes and their shortest equivalent alternatives.

Table B-2
Alternative Routes Mileage

Segment	Exi Rout	isting te	Miles	W/O Project	Miles	Diff.	Count
Shell Belt		AFE FABC	1.4 1.7	ABCDE FEDC	2.8	1.4 1.0	348 348
Coden Belt		GJI JGH	1.5 1.5	GHI JIH	1.5 1.5	0 0	407 408

11. Total annual costs of diverted traffic are estimated by multiplying the number of vehicles per day using each route, by the differences in mileage (from Table B-2), by \$0.14 per mile⁴, by 365 days per year, as shown in Table B-3. These costs are incurred during the one year period of construction.

^{&#}x27;Motor Vehicle Manufacturers Association, <u>Facts & Figures</u>
'88, (Detroit, 1989), page 44.

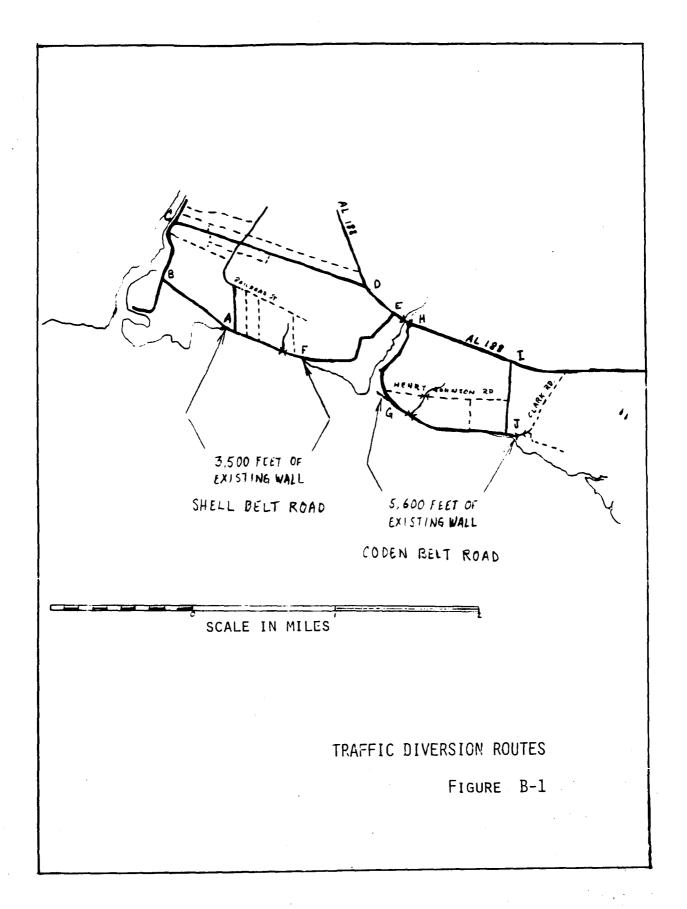


Table B-3

Computation of Annual Costs of Additional Travel

Shell Belt Road:

Route ABCDE:

348 vehicles/day x 1.4 miles x \$0.14/mile x 365 days/year x .843614 = \$21,003

Route FEDC:

348 vehicles/day x 1.0 miles x \$0.14/ x 365 days/year x .843614

= \$15,002

Shell Belt Total

\$36,005

Coden Belt Road:

_____0___

Total

\$36,005

- 12. The annualized value, based on the 50-year project life is computed as: \$36,005 x .090032 = \$3,242.
- 13. Road closure would also necessitate the construction, placement, and maintenance of barriers at access points along each project site road segment and warning signs along adjacent roads. According to information provided by the office of the Mobile County Engineer, effective barriers would cost approximately \$1,200 each in annual costs for construction, placement, maintenance, and periodic replacement. Similar annual costs for warning signs would be approximately \$300 each.

Table B-4 Computation of annual Benefits to Barriers and Signs

Shell	Belt Road	
	Signs, 5 @ \$300 x .843614	= \$ 1,265
	Barriers, 6 @ \$1,200 x .843614	= 6,074
	Total, Shell Belt Road	$= \$ \overline{7,339}$
Coden	Belt Road	
	Signs, 5 @ \$300 x .843614	= \$ 1,265
	Barriers, 4 @ \$1,200/year x .843614	4,049
	Total, Coden Belt Road	= \$5,314
Total		= \$12,653

14. The above values for the costs of signs and barriers would be the annualized benefit only under Alternative B, assuming permanent closure. Under Alternative A, signs and barriers would be necessary only for one year, the period of construction and repair. Annualized values for signs and barriers under alternative A would be computed as:

Shell Belt Road \$7,339 x .090032 = \$ 661 Coden Belt Road \$5,314 x . 090032 = \$ 478 Total = \$1,139

15. Bridge Construction. The office of the Mobile County Engineer also provided the replacement cost estimate of \$95,000, each, for the 34-foot-wide, precast, concrete bridges to meet minimum Federal design specifications at the location of the project site. Since the proposed project will extend the life of the bridge service already provided, a credit for this extension is incurred as a project benefit. The computations for these benefits are described below.

Computation of Bridge Replacement Benefits

1.	Cost of new bridge	\$95,000
2.	Life of new bridge	30
3.	Remaining useful life of existing bridge	17
4.	Bridge life extension	13
5.	Interest rate	8.875
6.	Capital recovery factor	.090032
7.	Annual cost	\$ 8,553.
8.	Present worth of annuity factor	7.537119
9.	Benefit in year 17 credited to life extension	\$64,465
10.	Single payment present worth factor	.235625
11.	Present worth of bridge life extension at end	•
	of period to failure	\$15,190
12.	Average annual credit at end of period to failure	\$ 1,368
13.		.843614
14.	NED benefit for initial bridge life extension	\$ 1,154
15.	Bridge replacement credit 30 years following	•
	end of period to failure	\$ 230
16.	NED Benefit per bridge	\$ 1,384
17.	Total NED Benefit (3 bridges)	\$ 4,152

- All three bridges at the project site were replaced in October 1979, following Hurricane Frederick. According to the Mobile County Engineer's Office, the bridges must be built to equivalent specifications at an average cost of \$95,000. an expected life period of 30 years. The basis for the credit for the extension of the useful life is that the replacement cost for the existing bridges will be deferred 13 years. The annual credit for years 18-30 is assumed to be equal to the average annual value (cost) of the new bridge for each of those years. This annual value (line 7) is estimated by multiplying the cost of the new bridge (li e 1) by the capital recovery factor (line 6). The credit is a ant annuity in years 18-30. Its present worth in year 17 (line 9) , the amount of the annuity (line 7) multiplied by the present wc h of an annuity for 13 years (line 8). The present worth at the end of the period to failure (line 11) is then this value multiplied by the single payment present worth factor for 17 years (line 10).
- 17. The average annual value of the credit line (line 12) is the present worth value multiplied by the capital recovery factor for 50 years (line 8). This must then be reduced to its current value by multiplying it by the present worth factor for 2 years (line 13). Since the life of the bridge will be renewed at the end of 30 years, an additional benefit for the difference in the present worth of the 50-year annuity is added as a further NED benefit accruing to the proposed project. Three bridges must be replaced for all alternatives for a total credit of \$4,152 (line 17).
- 18. Relocation and Replacement of Utility Poles and Lines. According to Alabama Power Company, relocation and replacement of 60 telephone poles adjacent to the seawalls and roadways in the project site would cost approximately \$1,100 per pole. These poles were also replaced following Hurricane Frederick. Each has a useful life expectancy of 25 years. This would increase the project benefits as shown in Table B-5. This cost is incurred under all three alternatives and is computed as a credit, based on the remaining useful life expectancy, as described under "Bridge Construction."

Computation of Utility Poles Bridge Replacement Benefits

1.	Cost of new poles	\$ 66,000
2.	Life of new poles	25
3.	Remaining useful life of existing poles	12
4.	Poles life extension	13
5.	Interest rate	8.875
6.	Capital recovery factor	.090032
7.	Annual cost	\$ 5,942
8.	Present worth of annuity factor	7.537119
9.	Benefit in year 12 credited to life extension	\$44,786
10.	Single payment present worth factor	.360464
11.	Present worth of poles life extension at end	
	of period to failure	\$16,144
12.	Average annual credit at end of period to failure	\$ 1,453
13.	Present worth factor for 2 years	.843614
14.	NED benefit for initial poles life extension	\$ 1,226
15.	Poles replacement credit 25 years following	
_	end of period to failure	\$ 383
16.	Total NED Benefit (60 poles)	\$ 1,609

Road Construction. Failure of the existing seawall and roadbed under either alternative would necessitate the construction of an entirely new road. According to estimates provided by the Office of Mobile County Engineer, costs of road construction at the proposed project site would be approximately \$60.00 per linear foot for a 24-foot-wide, rural-type, asphalt road, with an 8-inch sand and clay base and normal subgrade adjustment. This estimate of \$60.00 per linear foot includes cost for actual construction, engineering, inspections, underlayment, drainage, repair of damage to private and public property during construction, and physical adjustments to private and public property and structures adjacent to the newly constructed road. The estimated costs for property condemnation and acquisition are not included in the following estimates. The computations of annualized costs for new road construction under the alternative evaluations are shown in Table B-6.

Table B-6

Benefits to Road Construction Under Project Alternatives.

Segment Annual Benefits

Shell Belt Road \$60/ft. x 3,300 ft x .090032 x .843614 = \$15,039 Coden Belt Road \$60/ft. x 5,500 ft x .090032 x .843614 = 25,064 Total \$60/ft. x 8,800 ft x .090032 x .843614 = \$40,103

- 20. Bulkhead Construction. Bulkhead construction costs under the Federal project alternative have been estimated totaling \$329,000 for the Coden Belt Road segment and \$218,000 at Coden Belt Road. Under either option considered under Alternative A, the newly-reconstructed roadbed would have to be protected by a bulkhead equivalent to the Federal project, or face repeated failure of the existing seawalls and roads over the project life period of 50 years.
- 21. Computations of benefits accruing to the reconstruction of the seawalls under Alternative A, based on the estimated costs of the Federal-project alternative, are shown in Table B-7.

Table B-7

Annual Benefits to Seawalls Reconstruction (Alternative A)

Shell Belt Road: $$218,000 \times .090032 \times .843614 = $16,558$

Coden Belt Road: $$329,000 \times .090032 \times .843614 = $24,988$

Total : $$547,000 \times .090032 \times .843614 = $41,546$

22. Under Alternative B, private landowners would act to protect private residences located at the waterfront within 10 years after the high-water event which caused failure of the roads and seawalls. Given these conditions, private land owners would not be expected to construct a seawall equivalent to that proposed under the Federal-project alternative. This evaluation is based on estimated costs for a 2-layer, 6-foot-high, treated-wood bulkhead averaging \$100 per linear foot. This type private bulkhead is the most common type in the local area capable of surviving the 50-year project life period. Computations of total benefits accruing to the construction of private bulkheads under Alternative B are shown in Table B-8.

Table B-8

Annual Benefits to Private Bulkhead Construction (Alternative B)

Shell Belt Road:

\$100/ft x 3,300 ft x .090032 x 6.453119 x .843614= \$16,174

Coden Belt Road:

\$100/ft x 5,500 ft x .090032 x 6.453119 x .843614= \$26,957

Total = \$43,131

23. Road Fill (Alternative A, Option a). For this evaluation, the average effect at the time of failure is estimated to result in a 50 percent removal of the roadbed, to a depth of 6 feet, 50-feet wide, throughout the entire length of both segments. This would result in the need to replace 30,556 cubic yards of fill dirt at Coden Belt Road and 18,333 cubic yards at Shell Belt Road. The cost of fill dirt used to reconstruct the road bed to its original condition under Alternative A, Option A, is determined to be approximately \$5.50 per cubic yard, delivered to the construction site. Estimated benefits which would accrue to the placement of fill dirt is shown in Table B-9.

Table B-9

Benefits accruing to Placement of Fill Dirt (Alternative A, Option a)

Shell Belt Road:

18,333 cu yds x \$5.50/cu yd x .090032 x .843614 = \$7,659

Coden Belt Road:

30,556 cu yds x \$5.50/cu yd x .090032 x .843614 = \$12,764

Total \$20,423

- 24. Acquisition. Under the proposed Federal-project alternative, acquisition of additional rights-of-way would be unnecessary. However, both alternatives which provide for relocation of the existing roads and seawalls would necessitate purchasing the necessary right-of-way at fair market value. Estimated fair market value were provided by the Office of the Mobile County Tax Assessor.
- 25. Under both alternatives property would have to be acquired. The value of beach front property at both project segment locations is currently valued at an estimated average value of \$40,000 for an average residential lot measuring 75 feet across its south face (frontage) by 300 feet deep. Property located approximately 350 feet north of the existing rights-of-way is valued at \$10,000 per acre. It is also estimated that the costs to acquire the necessary property under eminent domain would increase the total cost by approximately 20 percent.
- 26. The computations in Table B-10 are based on the purchase of additional 50-foot-wide rights-of-way. Average values for the

rights-of-way are prorated as a percentage of the total value of property at the sites; and the average values are assumed to be equal at both project sites, under the respective alternatives. This results in a purchase price of \$88.89 per "front foot" for beach front property (Alternative A Option b) at both project sites, and \$11.48 per linear foot under the Alternative B.

Table B-10

Computation of Annual Benefits to Property Acquisition
Alternative A, Option b:

Shell Belt Road:

3,300 ft x \$88.89/ft x .090032 x .843614 x 1.2* = \$26,736

Coden Belt road:

5,500 ft x \$88.89/ft x .090032 x .843614 x 1.2* = \$44,559

Total, Alternative A, Option b = \$71,295

Alternative B:

Shell Belt Road:

3,300 ft x \$11.48/ft x .090032 x .843614 x 1.2* = \$ 3.453

Coden Belt Road:

5,500 ft x \$11.48/ft x .090032 x .843614 x 1.2* = \$ 5,755

Total, Alternative B

= \$ 9,208

(*Litigation factor.)

27. Relocation of Water and Natural Gas Pipelines. A total estimate of \$200,000 to replace natural gas and water pipelines at both project segments was provided by the Utility Board of the City of Bayou La Batre. Prorating this by the linear distance at each segment and reducing to its net present value would be computed as:

Shell Belt Road:

 $$75,000 \times .090032 \times .843614 = $5,696$

Coden Belt Road:

 $$125,000 \times .090032 \times .843614 = $9,494$

Total = \$15.190

These costs are incurred with Alternative A, Option b and Alternative B.

APPENDIX C

LETTERS OF ASSURANCE FROM LOCAL SPONSOR

JAMES L. "Jim" MASON, PRESIDENT
SAMUEL L. JONES, COMMISSIONER.
WILLIAM J. "BILL" MENTON, COMMISSIONER



W C MELVESTON ADMINISTRATOR DOUGLAS L. MODLING DEPUTY ADMINISTRATOR

MOBILE COUNTY COMMISSION

POST OFFICE BOX 1443 MOBILE. ALABAMA 36633
TELEPHONE (205) 690-8613 FAX (205) 690-4770

April 11, 1989

Commander
U.S. Army Engineer District, Mobile
Post Office Box 2288
Mobile, Alabama 36628-0001

Dear Colonel Bonine:

This letter will serve to advise you that it is the intent of the Mobile County Commission to sponsor the Portersville Bay, Alabama, Section 14 shoreline protection project.

We have reviewed the results of the reconnaissance level planning effort and the basic requirements of the Draft Local Cooperation Agreement (LCA). We have determined that the County can meet both the legal and financial obligations of non-Federal sponsorship for this Section 14 project. The Mobile County Commission intends to provide official project sponsorship when the Detailed Project Report has been completed and upon receipt of the final LCA. I have enclosed a certificate of authority which certifies that the county has the legal capability to act as a non-Federal sponsor.

We look forward to continued close cooperation on this project. If we can be of any further assistance toward insuring that the project moves expeditiously to completion, please do not hesitate to call us.

MES L. MASON, President

SAMUEL L. JONES Commissioner

BILL MENTON, Commissioner

Enclosure

JAMES L "JIM" MASON, PRESIDENT
SAMUEL L JONES, COMMISSIONER
WILLIAM J "BILL" MENTON, COMMISSIONER



W C. MELVESTON

DOUGLAS E. MODLING

MOBILE COUNTY COMMISSION

POST OFFICE BOX 1443 MOBILE, ALABAMA 36633
TELEPHONE 12051690-8613 FAX (205)690-4770

April 19, 1989

U.S. Army Corps of Ingineers U.S. Army Engineering District Post Office Box 2288 Mobile, Alabama 36628

Gentlemen:

This letter is written in my capacity as County Attorney. This is to confirm that Mobile County has the legal capacity to act as a non-federal sponsor of the Portersville Bay Shoreline Protection Project.

With pest wishes, I am

Very truly yours,

LAWRENCE M. WETTERMARK

County Attorney

CMW/kb

APPENDIX D CODE OF ACCOUNTS COST ESTIMATE

PORTERSVILLE BAY, ALABAMA - SECTION 14 PROJECT COST

	=======================================	=======	========	=======================================	========
	ITEM			Unit	Total
	Description	Qty	Unit	Cost	Cost
	=======================================	=======	=========	=======================================	========
FEDERAL	CONSTRUCTION:				
	Prep. Work			•	
10.0.A	Mob. & Demob.	doi.	ls		\$5,000
10.0.2.	Seawalls:				
	Timber Pile Timber Bulkhead	27300	1 f	7.5	204,800
	& Whales	134300	b f	0.95	127,600
	Bolts	24100	lbs	1	24,100
	Filter Fabric	6600	sy	2.75	18,200
10.0.R	General Items:				
	Cut Existing Pil	1960	1 f	6	11,800
	Sheeting Boards	12000	bf	0.5	6,000
	Rem Concrete Rub	2100	CY	10	21,000
	Debris Removal	300	c,v	5	1,500
	Compacted Backfi	4400	СУ	5	22,000
	Seed & Mulch	8	ac	1800	14,400
	Subtotal Construction	on			\$456,400
	Contingencies (25%				114,000
	Total Construction				\$570,400
30.	Planning, Eng. & Des	sign	ls		\$50,000
31.	Construction Manager		ls		34,000
	TOTAL CONSTRUCTION (COST			\$654,400
NON-FED.	LERRD:				
01.	Const. Staging Are		ac	2000	\$8,000
02.	Relocate Finger Pi			1	10,000
10.0.R.	Electrical Relocat	cion 1	job	ls	2,000
10.0.3.	'Seawall Drainage:	:			
	"12" Drain Pipe	6	l f	26	200
	"15" Drain Pipe	12	l f	32	400
	"12" Drain Pipe	27	$1\mathrm{f}$	38	1,000
	"12" Drain Pipe	27	1 f	48	1,300
	Contingencies (25%)				6,500
30.	Planning Eng. & Desi		ls		2,000
31.	Construction Manager	nent	ls		1,000
	TOTAL				\$32,400
	TOTAL PROJECT FIRST		=========	=======================================	\$686,800 =======

PORTERSVILLE BAY, ALABAMA - SECTION 14

PROJECT COSTS (CONT.)

36.	Planning, Engineering and design		
30.A.	Planning	\$	1,000
30.C.	Local Cooperation Agreements	•	-,
30.C.1.	Draft LCA		2,000
30.C.2	Final LCA & Financial Plan		4,000
30.C.3.	LCA Negotiations		2,000
30.C.4.	Transfer of Project to Sponsor		4,000
30.D.	Environmental and Regulatory Activities		
30.D.9.	All Other		1,000
30.Н.	Plans and Specifications		
30.H.A.	Subsurface Explorations		4,000
30.H.B.	Predesign Investigations		9,000
30.H.L.	Bidability, Constructability and Operability		
	Review		6,000
30.H.Y.	All Other EDC		5,000
30.M.	Cost Engineering		6,000
30.T.	PED Phase Life Cycle Project Management		1,000
30.Z.	Miscellaneous Activities		
30.Z.1.	Program Management TOTAL	\$	5.000 50,000
31.	Construction Management		
31.B.	Contract Administration		
31.B.1.	Preaward Activities		3,000
31.B.2.	Award Activities		3,000
31.B.3.	Review and Approval of Contract Payments		4,000
31.B.5.	Progress and Completion Reports		6,000
31.E.	Inspection and Quality Assurance		
31.E.1.	Schedule Compliance		7,000
31.P.	Project Office Operation		7,000
31.T.	Construction Phase Life Cycle Proj. Management TOTAL	\$:	4.000 34,000

NON-FEDERAL

01	Lands and Damages	\$ 4,000
02	Relocation	10,000
30	Planning, Engineering and Design	2,000
31	Construction Management	1,000
	Contingency	4,250
	TOTAL	\$21,250